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JUNE 1984

BRITAIN'S BIGGEST-SELLING HOME COMPUTER MAGAZINE

Vol. 4 No. 6

**Secrets of the black boxes—
QL and Amstrad reviews**

Dragon Kart and Animator

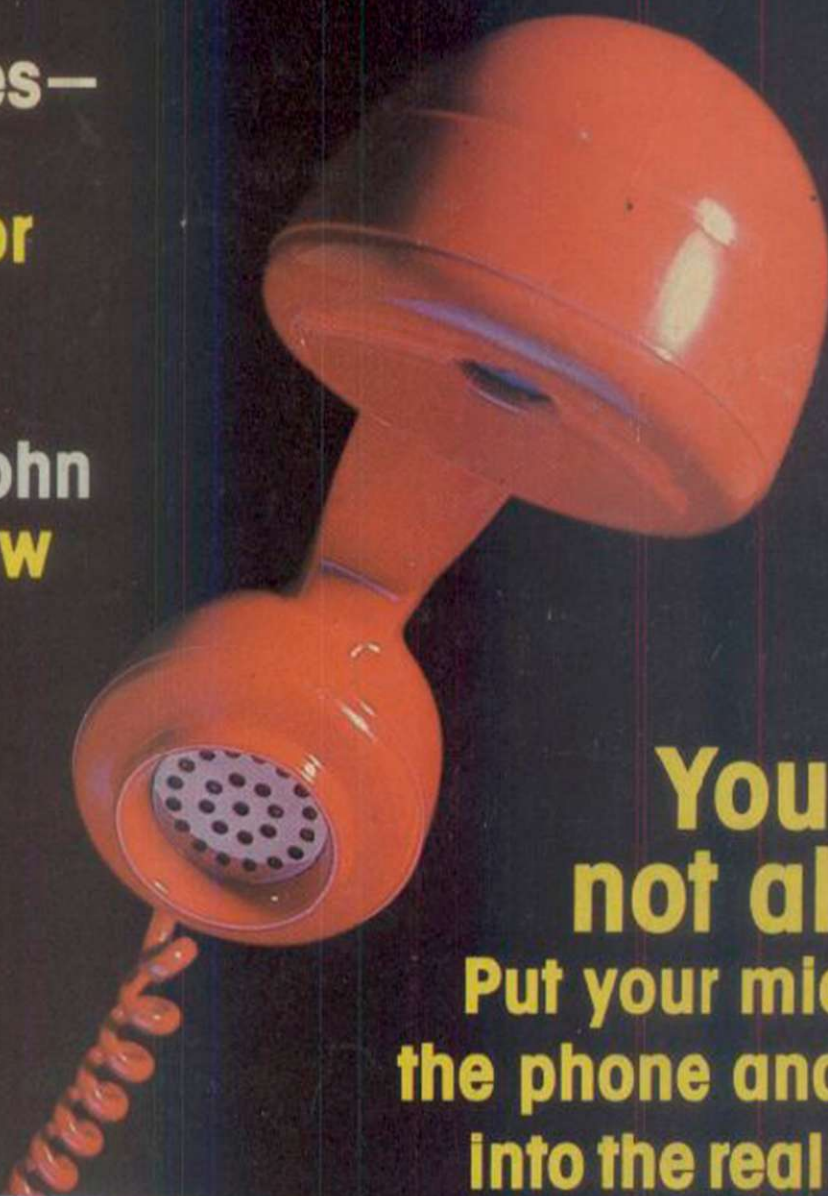
Atari World Quiz

Oric Trek

BBC Sprites and Krazy John

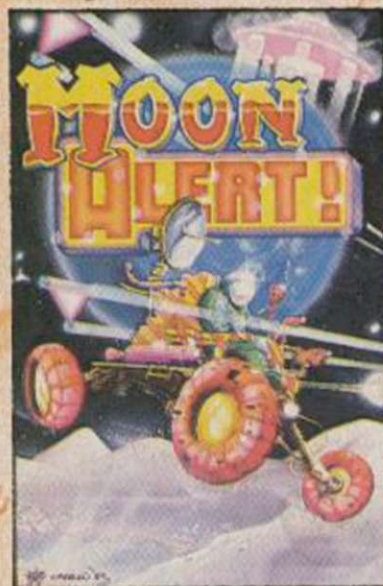
Pongo and Spectrum Draw

**CBM 64 games test
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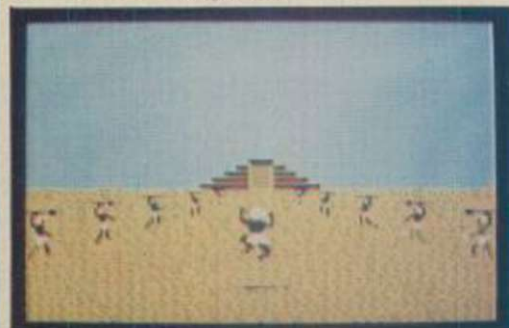
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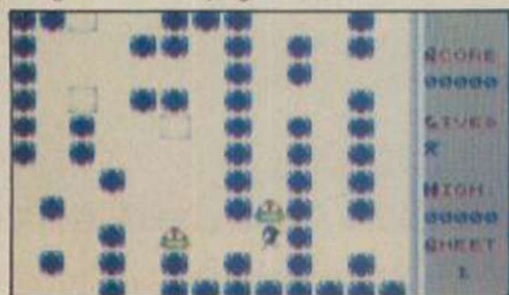
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44 NEWS: Autumn launch for MSX; cheaper Apple IIs with mice; at last the Acorn BBC Z-80 second processor; CBM-16, the Vic-20 substitute; QL controversy.

49 FIRST BYTES: Bit-mapped screens, logical operators.

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96 SPECTRUM PONGO: Pick up a penguin with Jonathan Ward in this chillingly exciting game. A chip off the old block.

98 CBM-64 CAVES OF MARS: In the last quarter of the 20th century, Bruce Russell turned his telescope on the red planet and discovered treasure.

103 ZX-81 HI-RISE HIVE: Dave Rogers and Colin Hogg plunge you headlong into an apiarist's nightmare. Can you get to the exit and avoid the killer bees?

108 ATARI WORLD QUIZ: No good talking to someone from Mendocino on your modem if you don't know where it is. HP Lord clues you in on Planet Earth.

113 BBC KRAZY JOHN: Excuse me, I just jumped off the Empire State Building. Control Krazy John, the foolhardy climber, in John Wilson's game.

117 VIC GUARDIAN: Extraterrestrial ghoulies and ghosties dog your faltering footsteps as you try to get treasure away from the unprincipled Guardian.

120 BBC SPRITES: Bobby Rao speeds up your programming by introducing you to some very user-friendly, easily defined sprites.

127 DRAGON ANIMATOR: The SAM chip is the real star of this show as Derek Gladding shows you how to get a little life into your graphics.

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142 DRAGON KART: John Nash screams round the track. This makes up for the apparent lack of car simulators on the Dragon 32.

147 MICRODRIVE FILE: Making the most of your Microdrive? Robert Newman looks at the possibilities for database management and data retrieval.

153 ORIC TREK: Dennis Salisbury takes his Oric out of planetary orbit and into the far distant reaches of the galaxy. Your chance to split infinitives all over infinity.

160 SINCLAIR QL COMPETITION RESULTS: The winner and also-rans — together with a selection of the best entries.

165 ZX-81 TEXT EDITOR: Julian Ossowkhi processes words.

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Learn a foreign language in twelve hours It's as easy as B

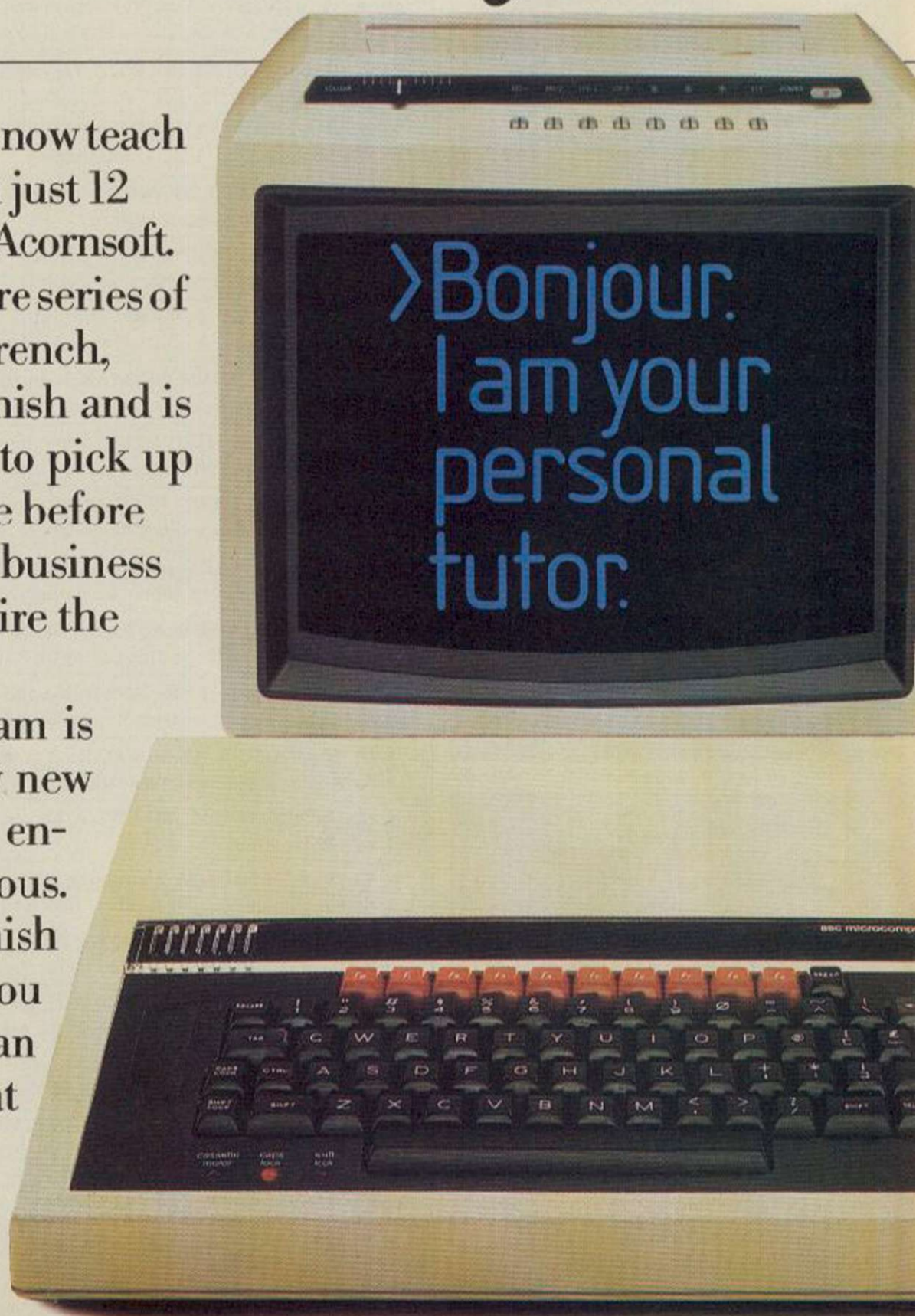
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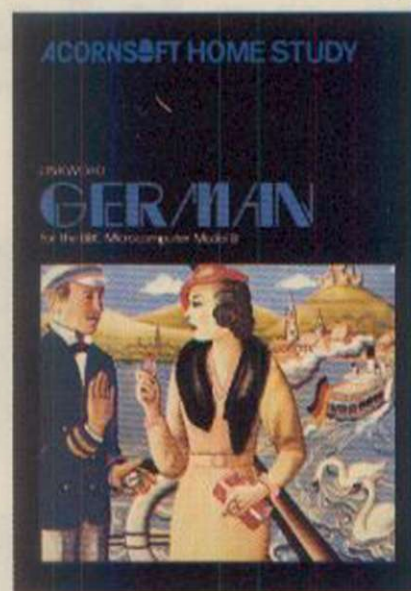
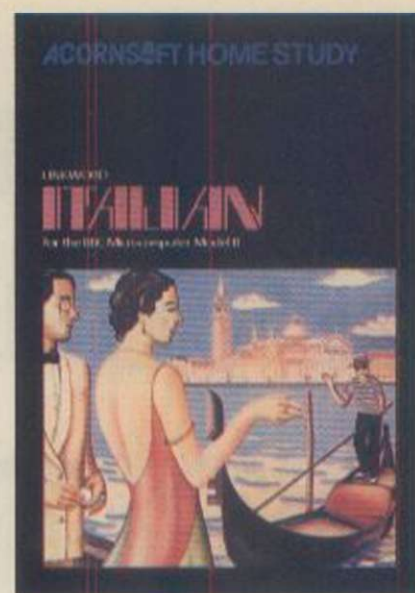
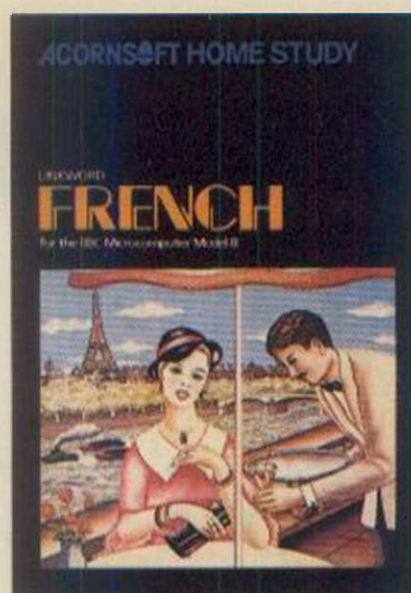
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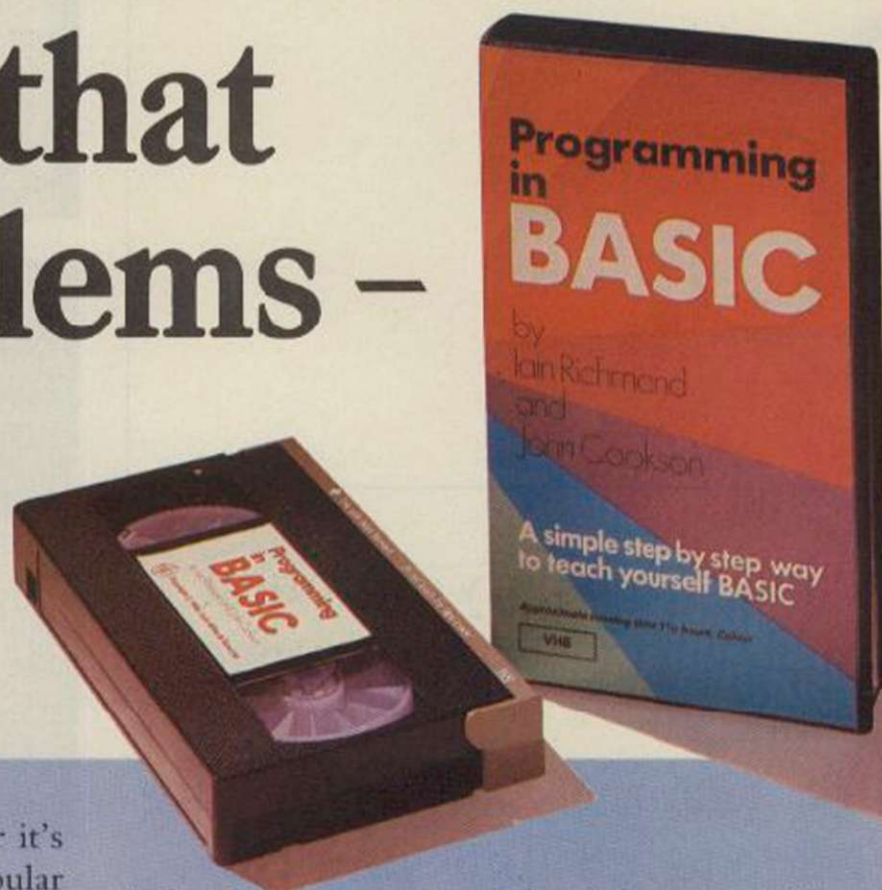
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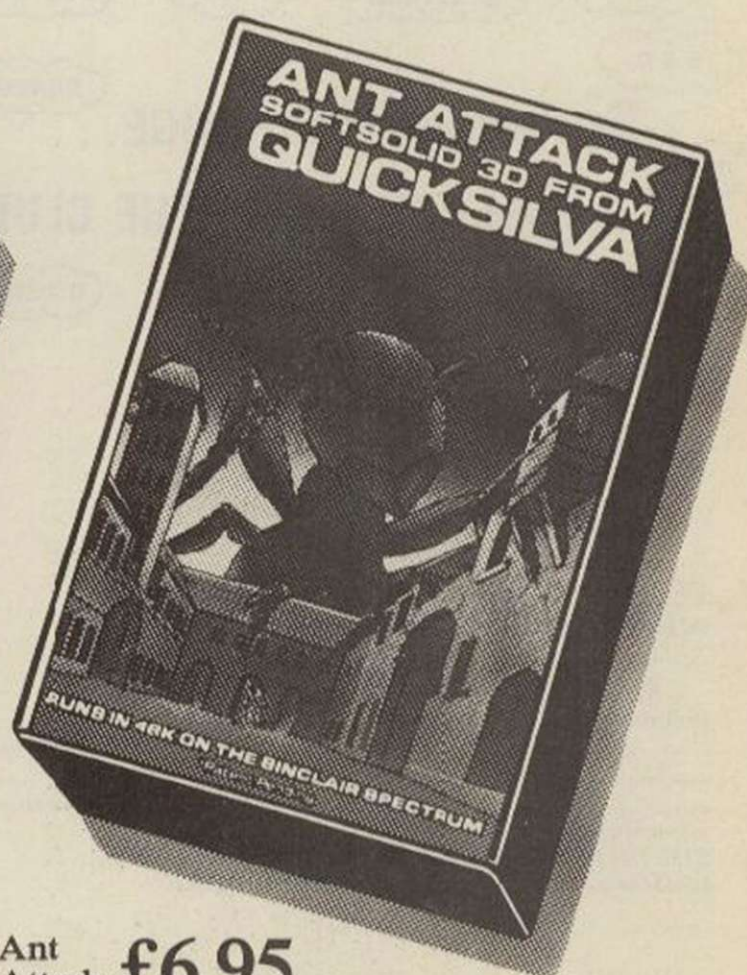


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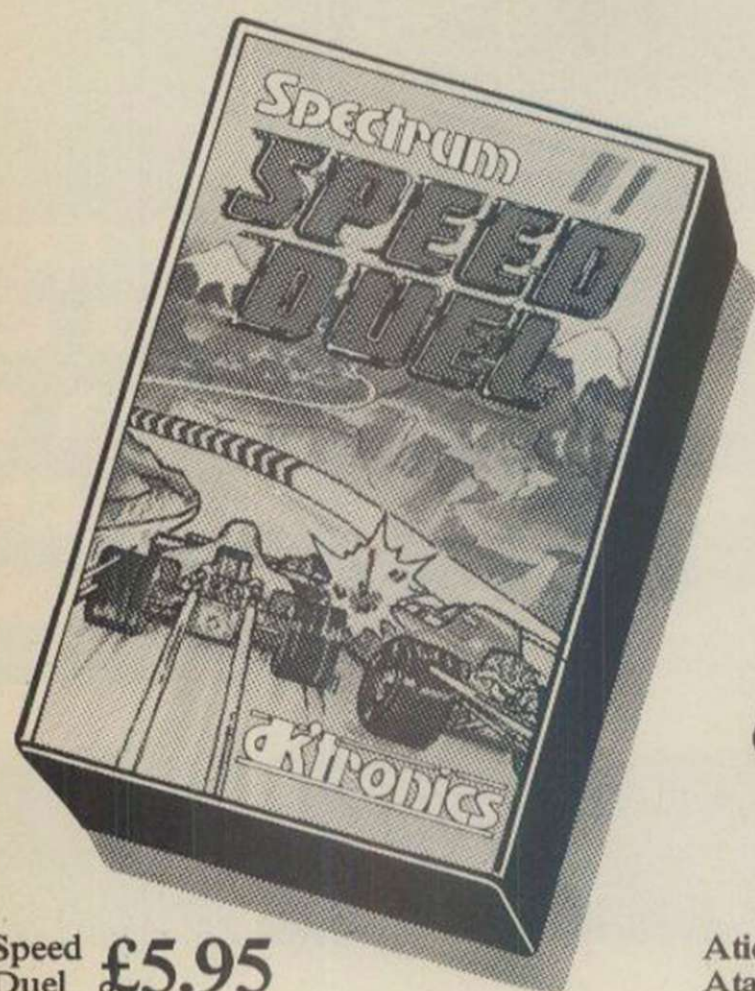
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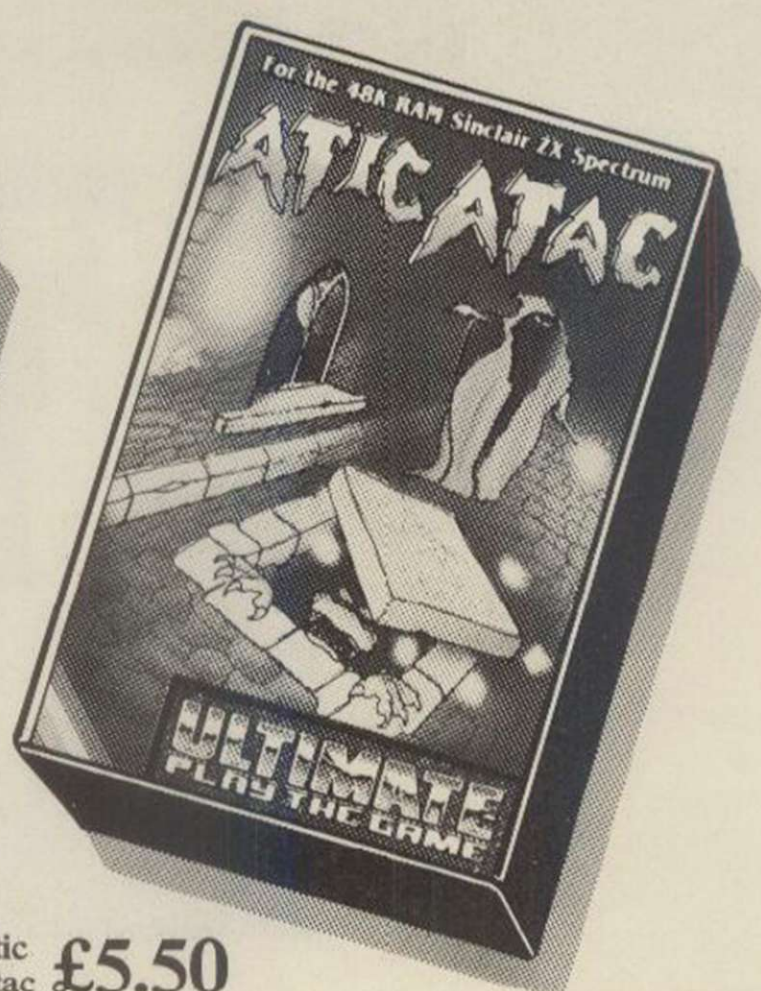
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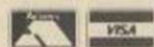
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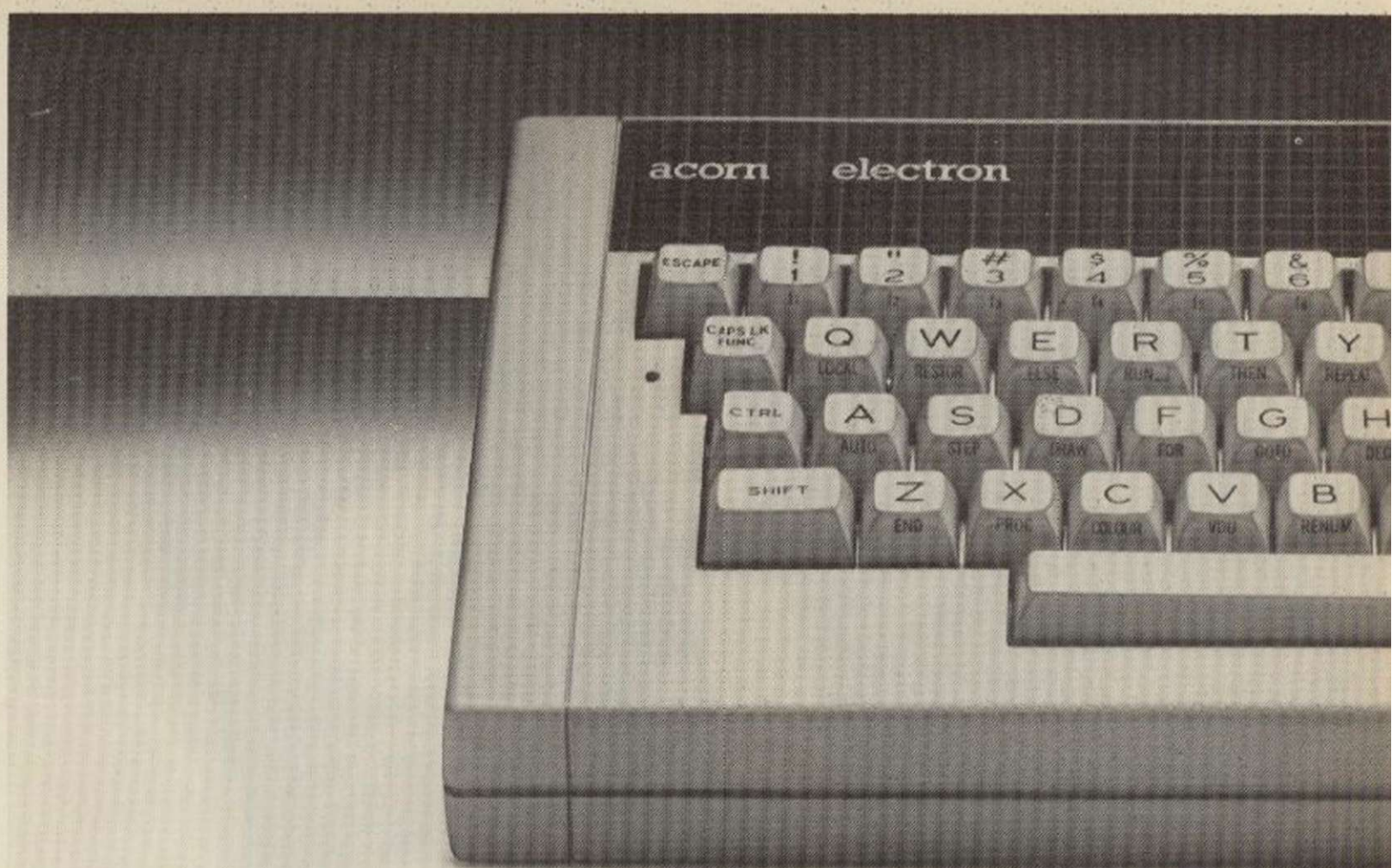
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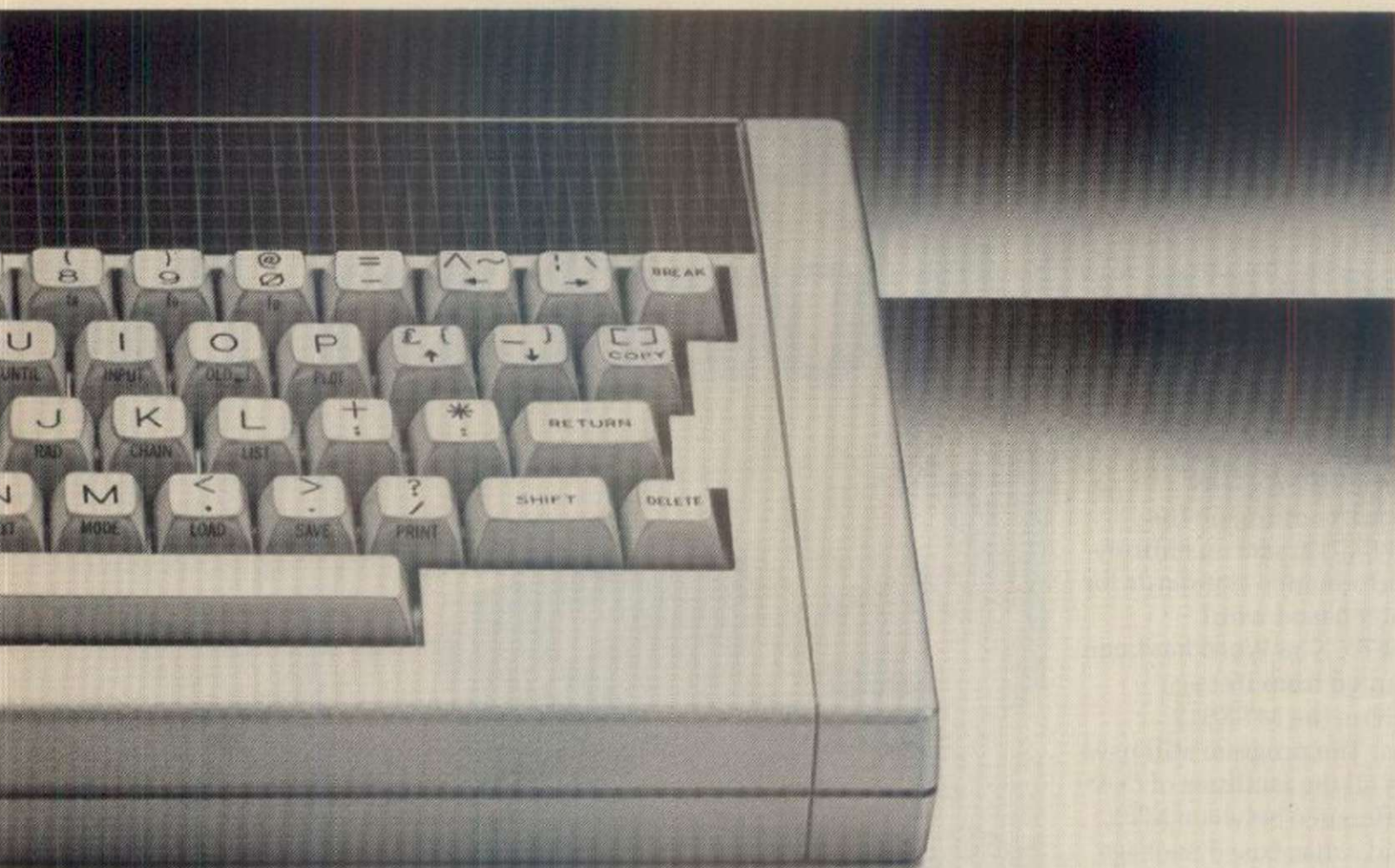
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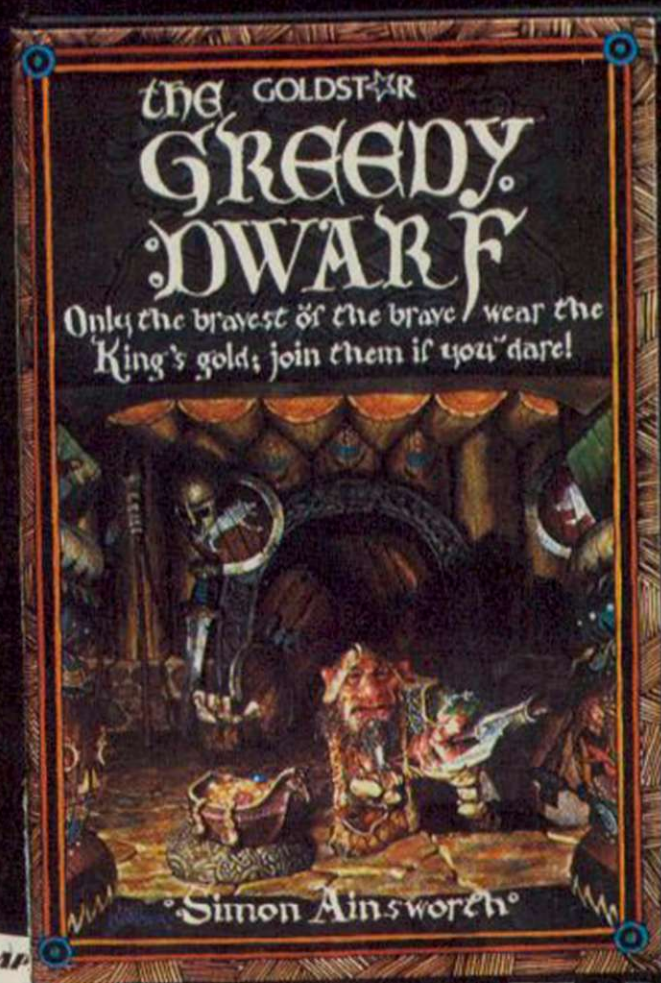
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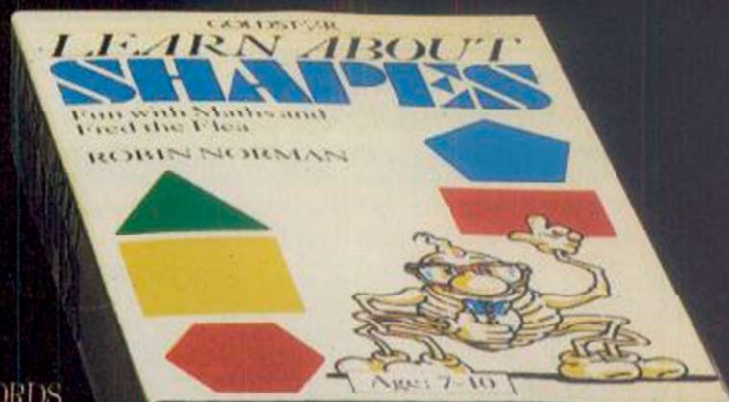


THE CITY OF 'EHDOLLAH
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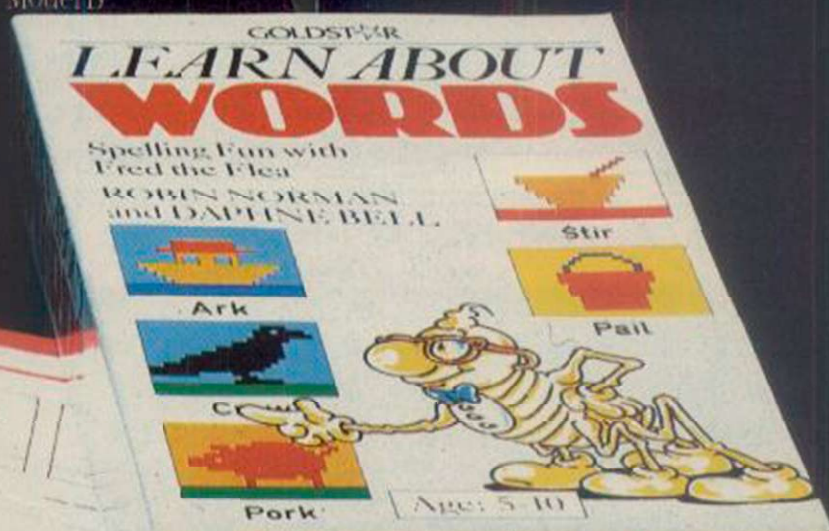
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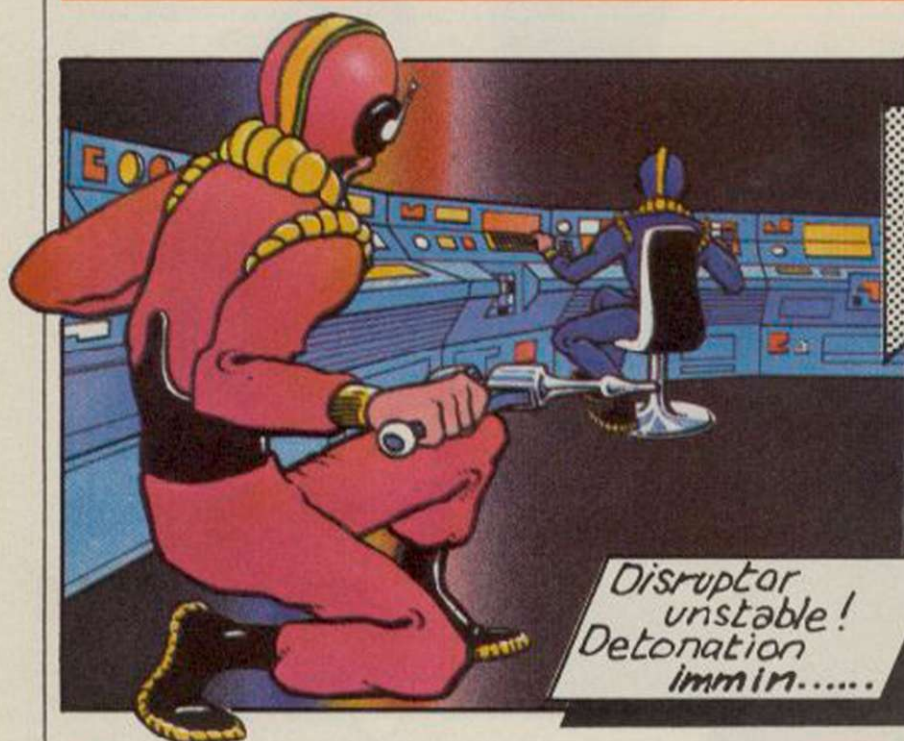
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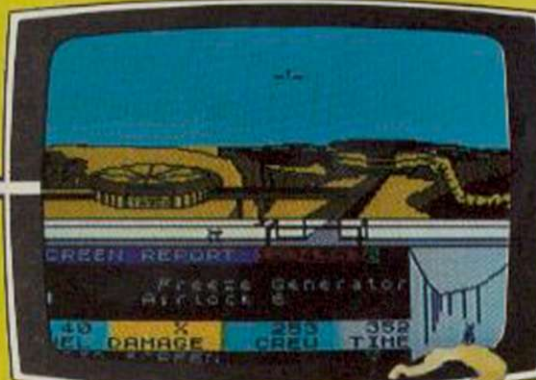
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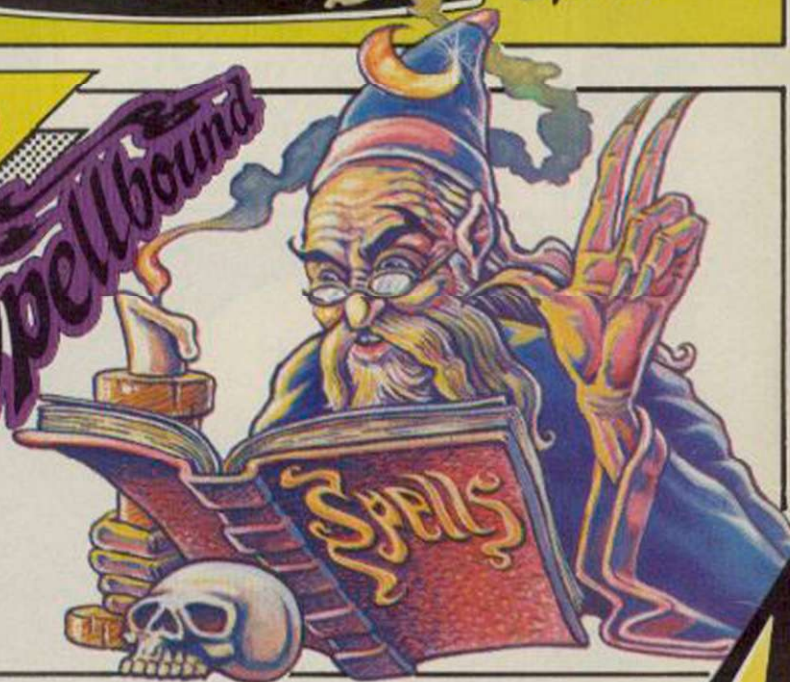
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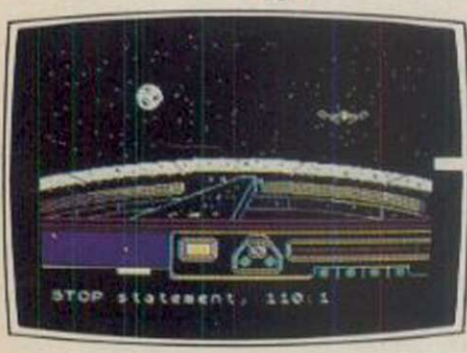
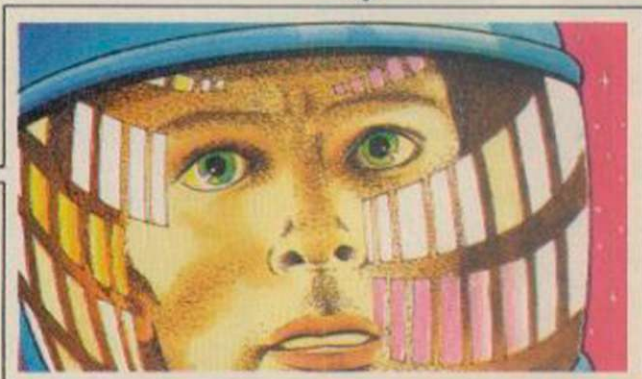
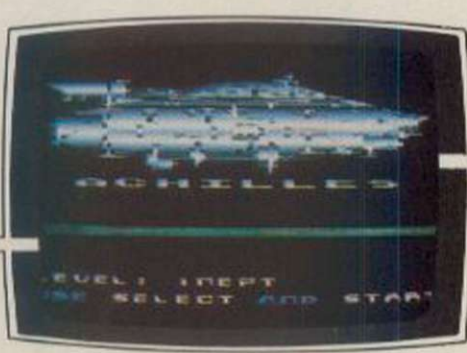
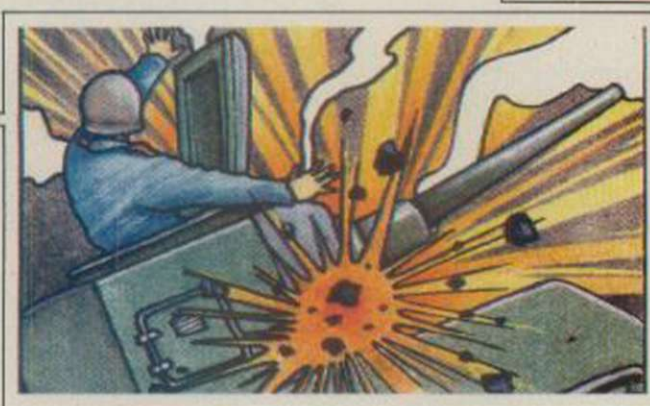
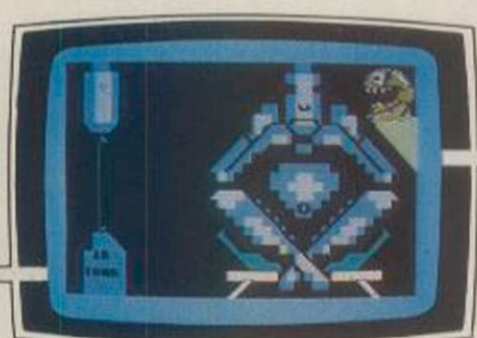
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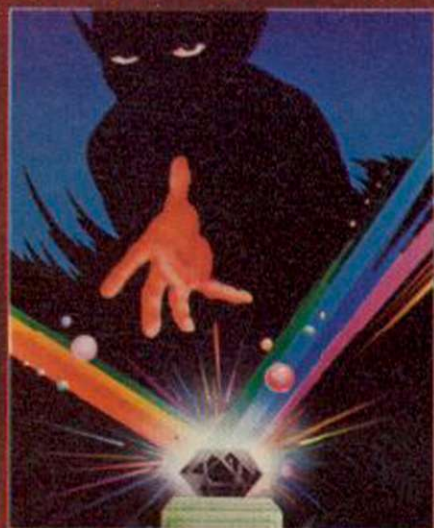
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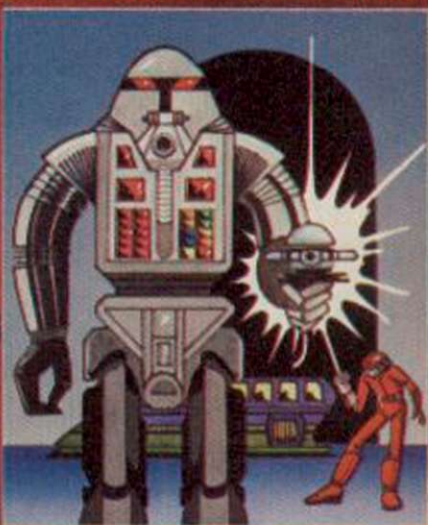
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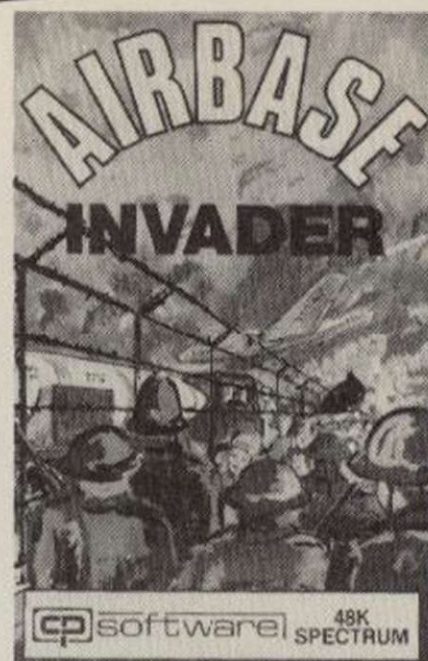
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13. Non-Deletable Lines	36. Contract	59. Paper Change
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15. Screen Search	38. Expand Rem	61. Flash Off
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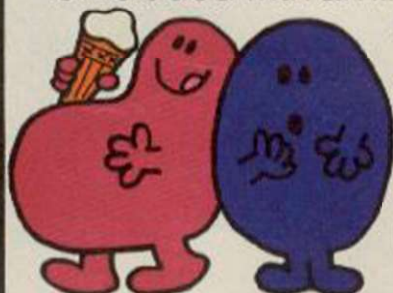
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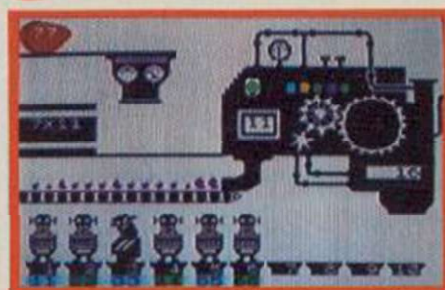
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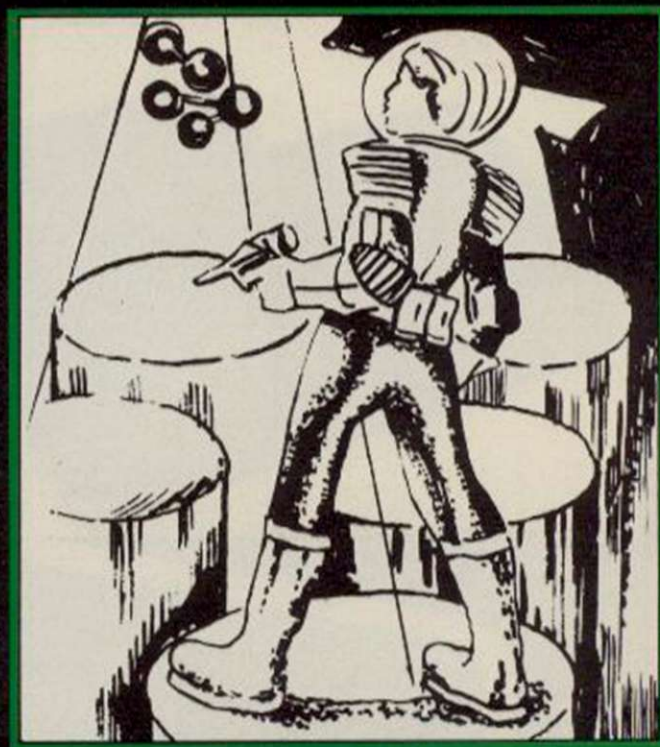
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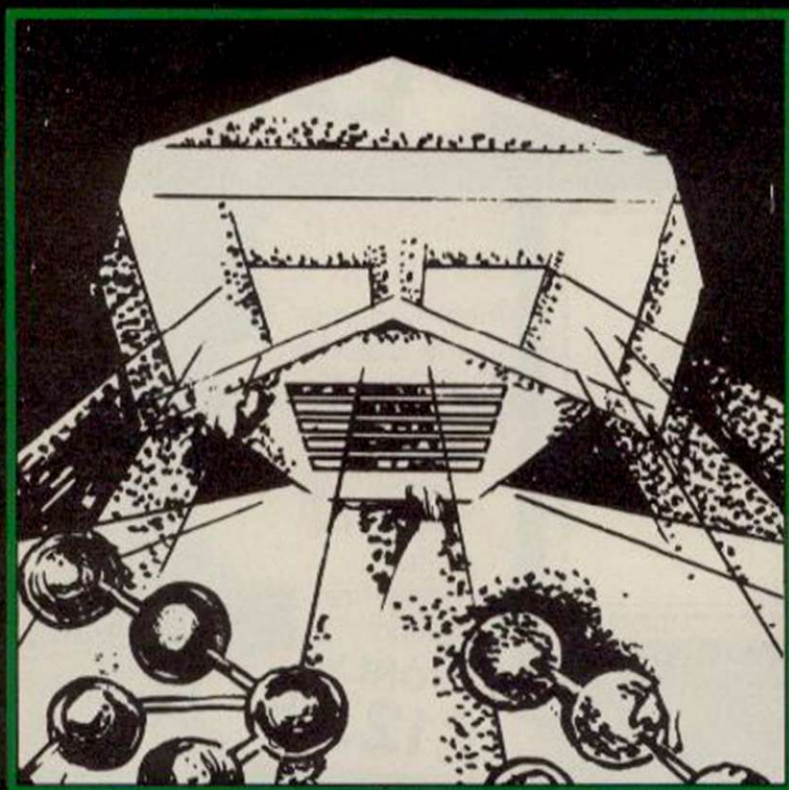
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
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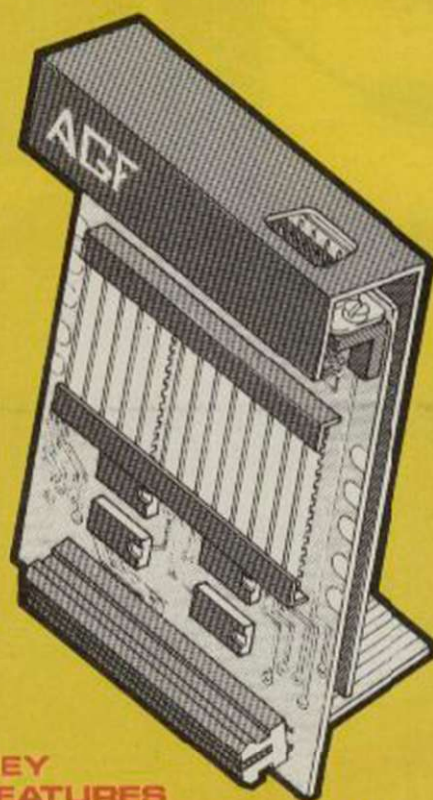
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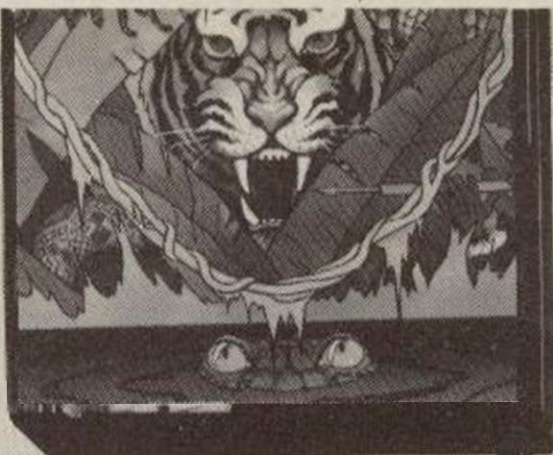
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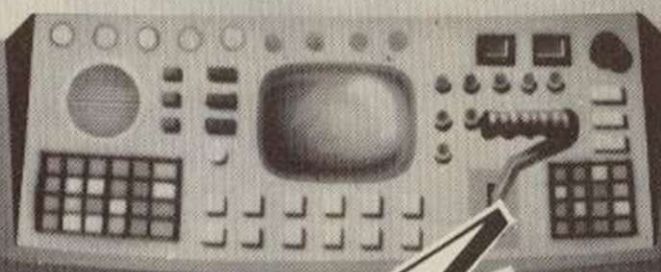
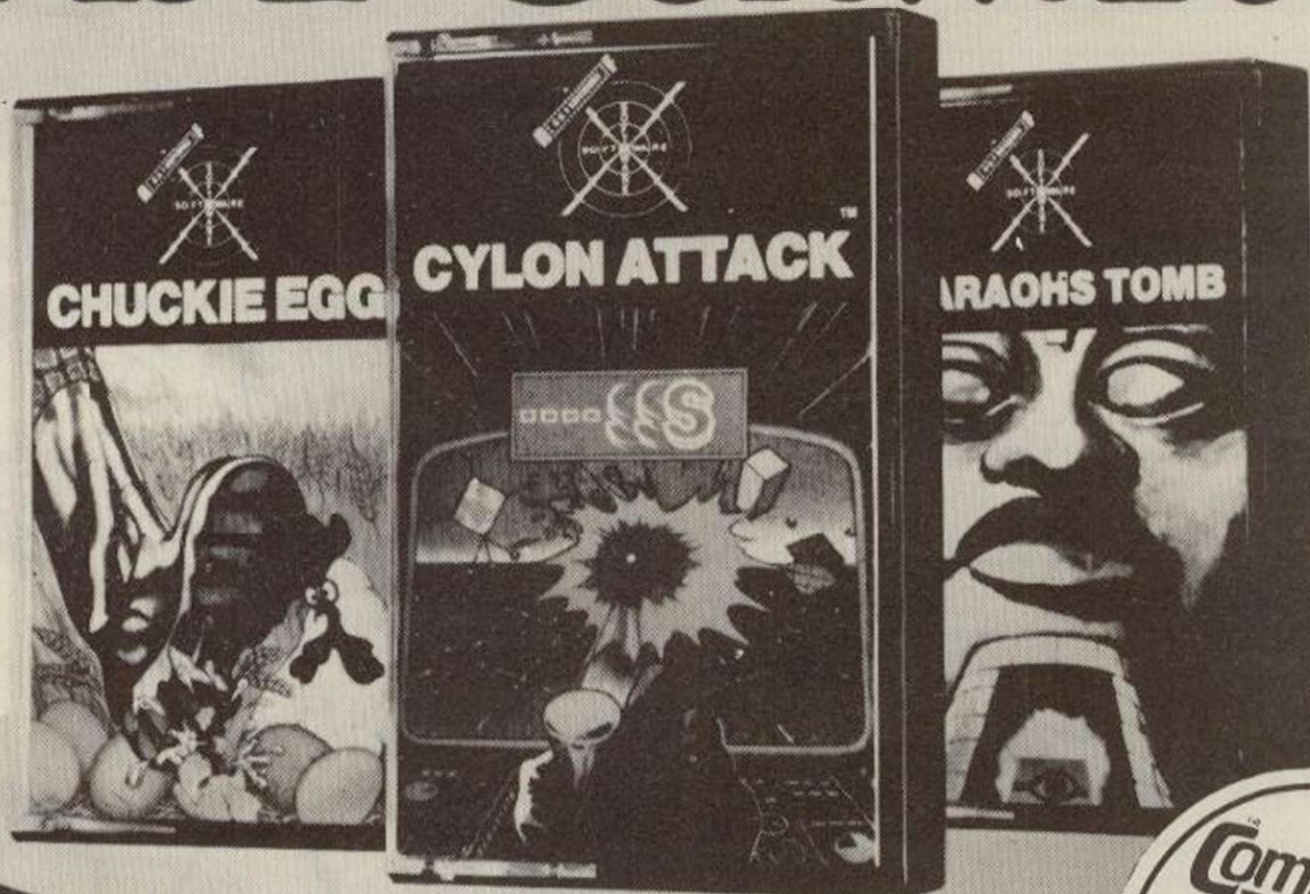
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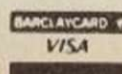
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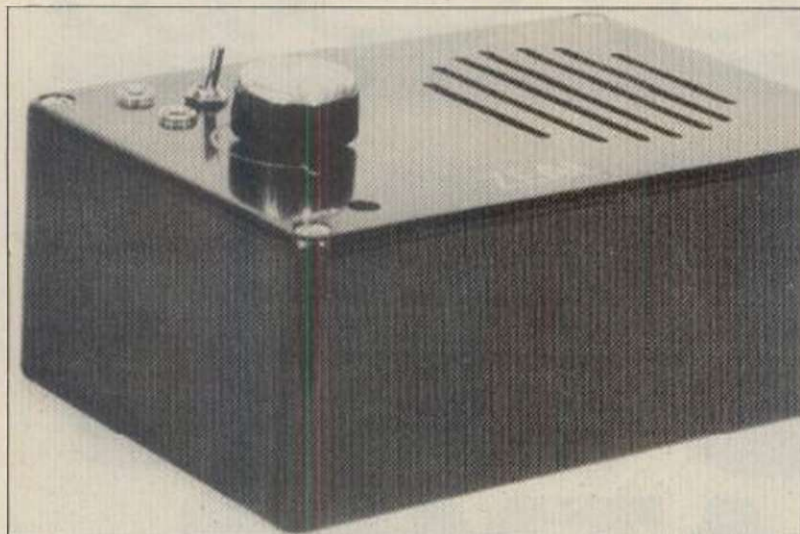
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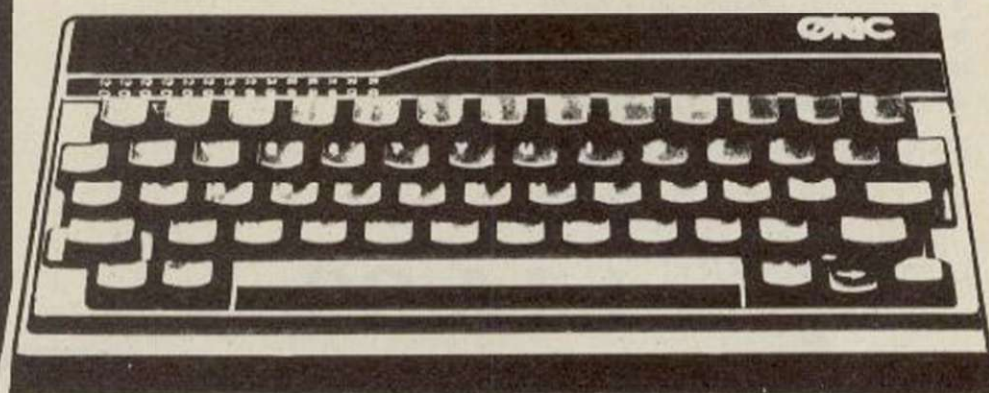
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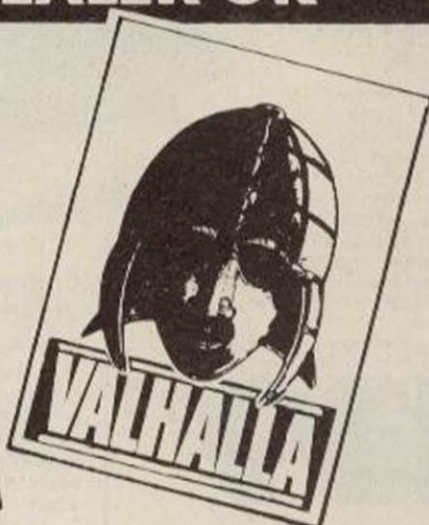
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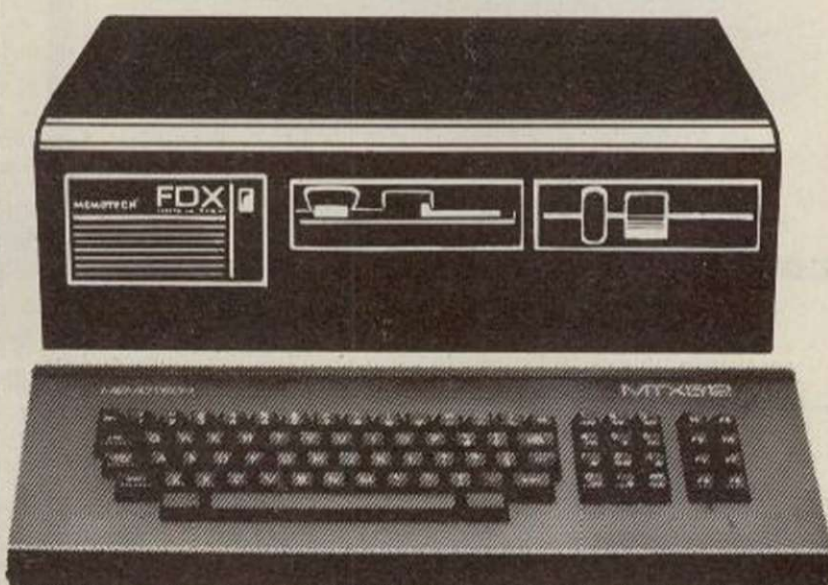
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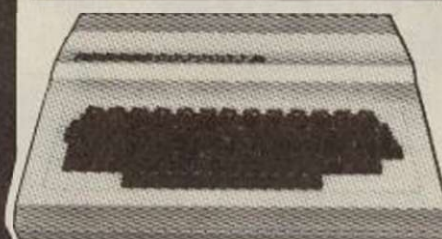
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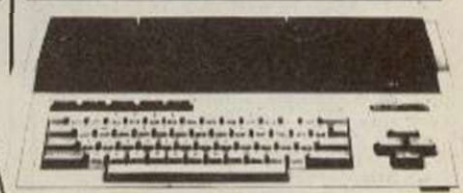


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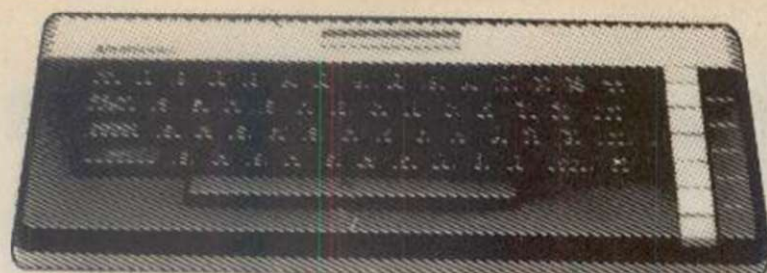
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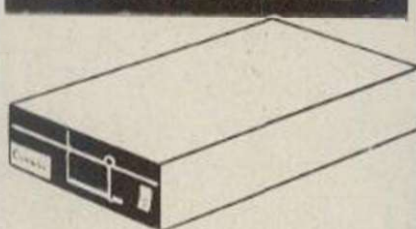
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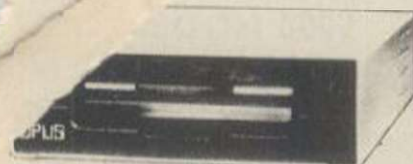
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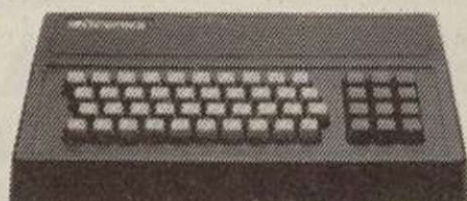
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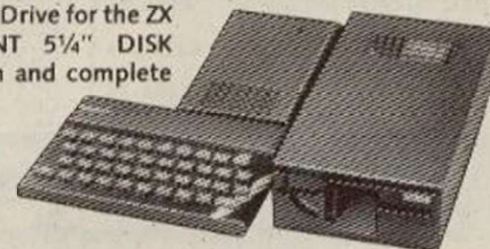
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Tel: (0295) 55890
OXFORD Ivor Fields, 7 St Ebbes St.
Tel: (0865) 247082

SCOTLAND

ABERDEEN North East Computers, 1-3 Ellis
St, Peterhead Tel: (0779) 79900
AYR Vennals, 6A New Bridge St.
Tel: (0292) 264124
DUMFRIES Vennals, 71 English St.
Tel: (0387) 54547
EDINBURGH The Silicon Centre,
6-7 Antigua St Tel: (031) 557 4546
GLASGOW Victor Morris Ltd, 340 Argyle St.
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HAMILTON Tom Dickson Computers, 8-12
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St Tel: (01) 940 8635
WALLINGTON Surrey Micro Systems Ltd,
53 Woodcote Rd. Tel: (01) 647 5636
WOKING Harpers, 71-73 Commercial Way
Tel: (04862) 61061

SUSSEX

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Arcade Tel: (0222) 31960
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Tel: (0978) 364404/364527

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NUNEATON Micro City 1A Queens Road Tel:
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Regent St Tel: (0788) 70522

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Princet. Tel: (0384) 238169
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son Square Tel: (0274) 309266
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DONCASTER The Soft Centre 8 Queens-
gate Waterdale Centre Tel: (0302) 20088
HUDDERSFIELD Richards (Formerly
Laureis) 12 Queen St Tel: (0484) 25334
HULL Computer Centre 26 Anlaby Rd. Tel:
(0482) 26297
LEEDS Bass & Bligh, 4 Lower Briggate.
Tel: (0532) 454451
YORK York Computer Centre 7 Stonegate
Arcade Tel: (0904) 641862

A SATISFIED QL CUSTOMER

In defence of Sinclair following the public outcry resulting from the late delivery of the QL, I am pleased to say that my computer arrived in the month of April as promised by Sinclair — delivered by private car.

I had attempted during the week ending April 28 to obtain a delivery date from Sinclair and was advised that no despatch dates on the QL were available on their inquiry computer. I was somewhat incredulous to hear the young lady say that delivery would still be met — yet another broken promise I thought.

On Monday, April 30 — the last day for Sinclair to meet their self-imposed dead line — no QL in the mail. During the day I was pleasantly surprised to be advised by my wife that the computer had been delivered to my Crawley address by car.

I placed an order with Acorn for a BBC A Micro at £235 prior to the price increase and suffered excuses and non-delivery for a year — until I gave up on Acorn. Even a letter to the Director General of the BBC duly answered by the BBC failed to evoke response from Acorn.

I was pleased that someone in the home micro business could keep a promise. The QL arrived complete with the add-on Eprom cartridge plus the free RS-232C lead and a blank Microdrive cartridge additional to the four promised. The manual was incomplete as no SuperBasic reference information was available. A note with the computer advised of despatch by post in the new few days.

The extra blank Microdrive cartridges are essential as you are requested in the manual to make back-up copies of the Psion software, the only blank cartridges to be supplied would thus leave no blanks for your own use.

The bundled software from Psion was quite impressive for its completeness — no home/small business micro user is likely to require more powerful software.

I await the remainder of the manual with interest to explore the facilities available — yes there are windows and they do seem to work. Thank you Sinclair for keeping your promise.



Ian B. Michie, Crawley, Sussex.

THE QL SAGA

Those who ordered a Spectrum in the first couple of days of its release received the computer within seven weeks. Any delay in ordering and the prospective customer joined the queue for a 16-week wait. The machine, except for a slight timing fault, was ready at the launch and Sinclair could reasonably point to the massive demand as an excuse for the delays.

Early 1983 the computing press in general gave Oric a very bad time for announcing a machine that was not ready. Those who placed early orders waited 14 weeks to receive a machine which was obviously sub-standard with terrible display problems. Even greater delays were found by those who ordered a while after the launch.

One year on, here we go again. Sinclair has sent letters to some of those people who ordered a QL before the official launch date of January 20 giving a delivery date of before the end of April — 16 weeks. It was still late. Complaints by the public were upheld by the advertising standards authority over deliveries of the ZX-81 and

Spectrum. This latest fiasco indicates how ineffectual writing to the authority becomes. I actually received a card post marked January 25 informing me that the QL was being processed for despatch.

On February 15 I received a letter dated February 9 informing me of the "expected" delivery date of before the end of April. This arrived virtually to the day on the 28-day original order delivery date.

Darren Robert,
Woking,
Surrey.

PAC-81 CHANGE

I want to thank you and Philip Harwood for that very good Pac-81 game. But while my children are used to the W-D-X-A keys to move up-right-down-left, I have made the following changes. Maybe they are of use for other readers.

POKE 16907,84
POKE 16914,76
POKE 16918,3
POKE 16921,92
POKE 16925,69
POKE 16929,2
POKE 16932,77

They also like to start playing with high score set to zero. This can be done by Poking 156 in the addresses 16865 to 16869.

I hope you will continue to publish machine code games for the ZX-81, because I find that's the computer most people started with.

G. Mannaerts,
Kluislaan 9,
B-2070 Ekeren (Antw).

NO TO BUTTER

With reference to *Your Computer*, March Kathleen Peel has dropped an awful clanger in her article on cleaning the Sinclair printer. NEVER USE BUTTER as a lubricant.

It contains (or is likely to contain) salt and water — guaranteed to cause corrosion on anything but highly alloyed stainless steel. Use Vaseline Instead.

I write this as an urgent message to prevent thousands of printers being irreparably damaged.

Don F. Gordon,
Sheffield.

DON'T USE VDUs

The article accompanying the Squares game for the BBC Micro, in the April edition of *Your Computer*, gives an erroneous impression regarding the use of VDU statements to speed up program execution. In the article, Keith Miles suggests that replacing commands such as Move and GCol by VDU25,4 and VDU18 will give faster programs.

Unfortunately, this is a commonly held misconception. Using these VDU statements will, in fact, make BBC Basic programs run slightly slower. As a general rule, it is usually

best to use special commands such as Move or Draw, where provided, in preference to the equivalent VDU statements. If readers wish to speed up the Squares program, I would suggest they try replacing the long variable and procedure names with much shorter ones, using upper case characters instead of lower case. While this leads to some loss of readability, these techniques have a more favourable effect on execution speed than the mistaken suggestions regarding VDU statement substitution.

Lawson B. Wakefield,
South Wirral.

GETTING IN

As you will probably know, the sequel to Manic Miner is out. Jet Set Willy is a superb program in two ways; first it is a great game and second it has one of the best protections I have ever seen. If you don't know what it is, everybody who buys the program gets a card which has 180 locations on it. At each of these locations there is a four-digit colour code. Whenever the user loads up the program, it will ask him to enter the code at any one of the locations.

The program only gives the user one go at entering the code. If he gets it wrong then the computer will ask for another location. If he gets this wrong the computer resets! In other words you must have the card to run the program. The card cannot be photocopied because the colours used in the code would not show up. Because replacement cards are not given out it would be disastrous if someone lost their card.

I have, however, found out a way of getting round this problem. Before you load the program type in

YC FINDS READER A JOB

I was interested to read your editorial — and would like to make a couple of observations. The first relates to your Design a Micro contest. We took up the opportunity to hire one of your entrants whose "product" and CV appeared in your last issue — it's very much part of our overall strategy of listening to what the active user wants.

The second is to observe that from your editorial assessment list of likes and dislikes about the computing scene at present — our machine is already the one most closely associated with your ideal — yet it is demonstrably the lowest cost product.

The third is to mention that your comment that Amstrad has no experience of making computers is perhaps counterbalanced by the simple observation that those presently in this market could use a few lessons in mass-producing a product for the consumer marketplace themselves — although I readily confess that half the fun of the computer press seems tied into the latest instalments in the "will they — won't they" sagas.

The separate establishment of Amsoft is playing a very important role in bridging the gap in Amstrad's knowledge of this marketplace by being staffed by the "usual" mix of people who are steeped in the business, bright lads and an eager following of independent authors plus an in-house publications team who are designing and producing a range of supporting literature that will be as much a feature of the overall project as the tower system of computing itself. We would not want you to think that Amstrad have not been thorough in their overall approach to a market which they see as featuring heavily in the future of any right minded consumer electronics marketplace.

William Poel, General Manager, Amsoft, Essex.

25 POKE 23672,0:POKE 23673,0:
POKE 23674,0

then instead of loading the first program use the Merge command — this stops the autorun. After the first program is loaded, stop the tape, type Run and start the tape again. The program will load and run normally.

Finally, I also found a way of getting more lives. This is done by typing in:

35 POKE 34785, (the number of lives you require)

at the same time that you would type in line 25.

Mark Sanderson,
Taunton,
Somerset.

HEX ERROR

I would be grateful if you could point out an error which crept in during your re-writing of the hex-loader accompanying my 'Tapesys' article in your magazine, as I have already received two enquiries regarding this:

Line 30 should read:

30 DEF FN h(h\$)=CODE h\$ - 48 - 7*
(h\$(1)7"9")

as otherwise, bytes beginning with 9 — e.g., 50056 — are not properly converted. The hex listing itself is fine, so no problems will have been encountered by those using their own hexloaders.

The editing out of the assembler language listing has also caused some confusion. See the following two addresses:

MSGP = 51557

PAUSD = 51638

Paul Rhodes,
Luton,
Bedfordshire.

BETTA BASIC

A few mistakes crept into the ZX-81 program Betta Basic in the April issue of *Your Computer* and I would be most grateful if you could publish the following corrections.

First my name Jason and not John as the article says. A line of spaces has disappeared from the top listing on page 131. Line 10 should read:

LET RS = "(34 spaces)"

Under c) of the PRT command on page 126, a semi-colon has been omitted. There should be two of them after Print statement and not just one as shown. Lastly, error "T" means "missing comma", i.e., one or more arguments have been left out when a routine expects one.

Jason Judge,
Cheltenham,
Gloucestershire.

CORRECTIONS

An error crept into the hexloader program, Listing 1, for the Quickload feature in the May issue. Line 90 should read: LET z=FN h(a\$(1))*16+FN h(a\$(2)).

The ZX-81 Speech article in May neglected to mention that the machine code needs to be stored in a Rem statement. At the front of Listing 1 insert a Rem statement containing 400 characters as Line 1.

WHAT WAS IT THAT made some of the U.K.'s biggest shops and software houses meet in secret with a group of foreign electronics manufacturers? If you happened to know that that manufacturers in question were Japanese, the answer to this riddle becomes a little clearer. Whatever went on at that meeting in April persuaded 20 of our largest software makers to produce MSX programs.

Three months ago MSX, the software and hardware specification adopted by most of the Japanese manufacturers, looked to be no more than an interesting exercise in standardisation. Now the well developed U.K. market has been singled out as the first stop in an itinerary of world domination. Soon MSX giants such as Sony, Yamaha, JVC and Hitachi will threaten the future of the British companies Acorn, Dragon, Oric and Sinclair.

Even computer firms outside Japan are coming round to the idea that software compatibility is important. Proud independents like Commodore are being forced to go for standardisation — the latest Commodore business machines are IBM compatible. Acorn's Z-20 version second processor turns the BBC Micro into a CP/M machine.

Companies like Binatone, cautious after its ill-fated 1982 computer project, have been looking very carefully in recent months at going for the safety of MSX. The bigger rewards of going their own way will always be matched by bigger risks.

With the Japanese flair for manufacture, marketing and distribution behind MSX it may look unstoppable. But there are strong arguments against it: standards by their very nature go for proven technology — and MSX is no exception.

If MSX's Z-80 based hardware specification

appears a little staid today, what will it look like in 1986. Even by 1985 Sinclair will have sorted out the QL's teething problems. Furthermore, could the MSX choice of well established technology actually put a brake on software development.

The pro-MSX lobby says that this is missing the point. MSX machines will not necessarily be bought by Spectrum owners who have been educated to expect always a technological step up when they buy a new micro.

MSX will find its market with those who have held back for fear of buying a lemon computer. Quantum leaps forward in innovation are unpopular when equated with quantum leaps back in reliability. Also for new buyers the guarantee of software support may be more important than the machine itself.

As for the point about software development, programs have a lot of catching up to do before they find existing hardware a hindrance. Imagination has always been the limiting factor.

What is certain is that with MSX computers being internally identical, the cosmetics of computer design will become even more vital. No longer will Sinclair be able to say you can have one of his computers in any colour as long as it is black. MSX micros will also be marketed on their expandability, so the add-ons market will receive a new uplift.

Even though the British manufacturers know what they are up against, they have little time to prepare for the battle which will start this autumn. If they fare well in the first wave of the attack they will find little reassurance in the description of MSX as being no more than the prototype for MSX 2.

How to write for Your Computer

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Why not give it a try? You have nothing to lose but your postage.

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"Waiter — there's a mouse on my Apple" "Sir — keep quiet they'll all be wanting one"

MICE ARE MOVING IN. Apple's long overdue price cut and the introduction of Mouse IIe means that you can buy a disc-based Apple IIe with a mouse and a Macintosh-style Mouse-paint program for £930. A raw Apple IIe now costs £595 instead of £845 and if you already have a 64K Apple with disc the mixed hardware/software Mouse IIe package is extremely good value at £135.

Apple's mice with everything policy even extends to the new Apple IIc battery-operated portable. This is smaller than a portable typewriter and much lighter — just 7½ lb., yet includes a built-in disc drive and 128K memory. It is also much more



expensive — £925. Until the liquid-crystal display panel for the IIc arrives in a few months typing in programs on the move will be a matter of guesswork, though it will plug into a TV at home, and the optional mouse may be a little bit difficult to use on your lap on a train or bus.



Epson — which has also announced a portable this month, the PX-8, has taken a different route



based on the lessons of the Epson HX-20. Although the price is similar, £1,000, the PX-8 has just 64K of RAM and a minicassette instead of a disc drive. However, it has a pop-up eight-line 80-column LCD display as standard together with built-in word processing, spreadsheet and communications.

Life after the MC-10

TANDY'S MC-10 colour computer introduced just over six months ago for £99 has already bitten the dust. Our review at the time in October 1983 described it as overpriced, a non-runner and a year too late. Now the last few MC-10s are being sold off for less than £40 each.

No product has been announced to take over from the MC-10 or its ancient bigger brother the Tandy Colour Computer. However, John Roach, Chairman of the Board of Tandy Corporation, is talking about introducing "adequate home systems for £500 to £1,000" consisting of keyboard, computer, disc drive, printer, and software.

Although the launch of his Enterprise home computer has been delayed till September Enterprise director and International Chess Master David Levy, at the chess board, still has plenty to smile about. Since the 1960s he has laid a series of bets that he could beat any computer at chess. Until last month's GEC Dragon Computer Chess Challenge no machine had ever had the better of him. The Dragon Chess Challenge proved to be no exception — Levy won again. Not surprising, you might think, if he was playing against a Dragon, but David was up against a Cray XMP mainframe — one of the most powerful computers ever built, and it was running the best computer chess program yet written — whose author Robert Hyatt is on the right of the picture with his terminal linked to the Cray.



Acorn's £300 Z-80 package will turn BBC into business machine

FOLLOWING ITS release of a 6502 second processor, Acorn has now launched a Z-80 version which turns the BBC into a CP/M-based business system. For £299 the unit provides 64K RAM and comes with a suite of programs that are intended to meet all the needs of the small business.

Acorn says that the software would be worth £3,000 if sold separately. Along with CP/M 2.2 which is supplied with the GSX Graphics System extension, the package includes word processing, database, spreadsheet and account-



ing programs, as well as Nucleus, a program generator.

Together with these application programs there are three languages — CIS Cobol, Professional Basic and a Z-80 version of BBC Basic. Professional Basic takes code generated by Nucleus and is also compatible with Microsoft Basic.

In addition to the bundled software it will also be possible to run many of the existing range of CP/M programs. Acorn has com-

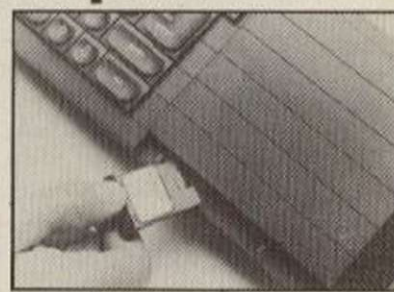
missioned Software Ltd to configure its catalogue of 300 packages to BBC disc format.

The dual-processor system gives substantial speed improvements. By handling over all I/O processing — disc and screen handling — to the 6502 processor, the Z-80 is left free to concentrate on running programs. On top of this, the processor used is a Z-80B which runs 50 percent faster than the more common Z-80A.

Sinclair QLs arrive so do the complaints

FRANTIC DASHES in hired cars delivered the first few dozen QLs before midnight on the last day of April. So much for the good news — that the first QLs were delivered to customers a mere 11 and a half weeks after the 28-day delivery time elapsed. A Sinclair spokesman described this delivery as "quite genuinely a goodwill gesture".

The bad news is that the few QLs which have been delivered are not working properly. Apart from the overspill box plugged into the ROM socket — see QL review page 64 — which prevents you using plug-in ROMs, QL owners have been ringing up to complain about their machines. Shoddy finish and often unloadable software seems to be the



least of their problems. The Screen Editor can make the system crash and the promised real-time clock is missing — along with the manuals.

It will be at least a couple of months until real QLs with the whole operating system on the main circuit board go out and Sinclair Research is hoping to iron out the bugs before that happens.

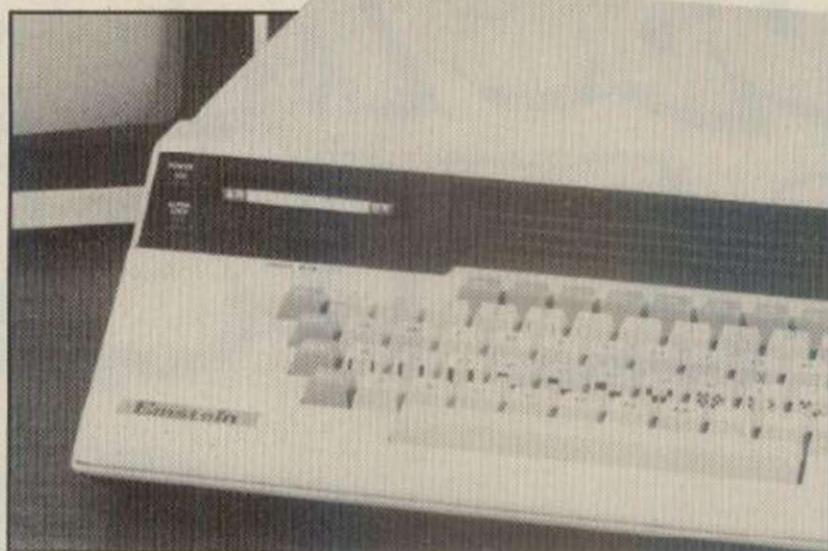
September MSX launch

SECRET MEETINGS with software houses and Japanese manufacturers over the last two months have convinced Britain's biggest high street stores to back the oven-ready computers — MSX micros.

The shops have agreed to take hundreds of thousands of Sony Hit-Bits Sanyo MPCs, Toshiba Pasopias, Yamaha CX-5s and Canon V-10s starting from September, not to mention Hitachis, JVCs, and Mitsubishis. See *Your Computer* March 1984 pages 68 and 69. The stores are confident that the reputation of the Japanese for reliability plus the confidence of knowing that all the software is interchangeable will convince many sceptics to buy a home computer this Christmas.

Now they are pressurising software houses to convert all their best programs to MSX. One programmer told us bluntly: "the big multiples have said, 'You're writing for it!'" Meanwhile, Spectravideo, the company which launched the SV-318 and 328 nearly MSX computers is working on a cheap portable which really will run MSX programs this time.

Cooking with a computer conjures up images of the early days of the ZX-80 when overheating could be delayed by making hot drinks on the back of the machine. Now Bug-Byte has employed a chef, Ian Hoare, to produce a computer cookbook. You just tell the computer what you have in the fridge and it will suggest some suitable recipes. The program will even tell you what wine you should drink with your meal. It can select recipes by price, country of origin and how long the meal will take to cook. The Computer Cookbook which is only available on the Spectrum costs £9.50 for 80 recipes.



Tatung built-in disc was Einstein's secret

DESPITE ITS NAME the Tatung Einstein deserves to be taken seriously — if only because it is the first computer with a built-in disc drive to break the £500 barrier.

The Einstein has similar performance to the MSX micros, not surprisingly as it has a Z-80A central processor, Texas TMS-9129 video chip and AY-3-8910 sound processor but it has its own Tatung/Xtal Dos and Basic. There is 64K of RAM with an additional 16K video RAM and 8K ROM expandable internally to 32K. This gives it 256 by 192 resolution, 16 colours and 32 sprites with 40-column or 32-column text. 80-column display will be an option.

What makes it different is the built-in 500K 3in. Teac disc drive. This gives 200K per side formatted.

Tatung is a Taiwanese company, the name means Universal Family, and the company motto is "Honesty, integrity, industry and frugality". Tatung describes the Einstein as "all-British" but it might be more in line with the company motto to say it is designed and assembled in Britain.

The Einstein has a full typewriter keyboard, Centronics and RS-232 ports, A/D converter and Z-80 bus. A second disc drive can be fitted into the Tatung's case as well as up to another two externally.

Watch out, Martians have landed: War of the Worlds on a Spectrum

WHAT WITH interplanetary travel, tanks and time machines H G Wells never quite got round to inventing the home computer but if he had, perhaps *War of the Worlds* would have come out first as a video game rather than after the book, film and record.

When Clement Chambers of Computer Rentals Limited wanted to produce a video game based on the Wells book he was not sure who to approach for the rights — but in the end it turned out that Jeff Wayne who made a *War of the Worlds* record in 1978 also had the game rights. Jeff took an interest in the project — as well as a cut in the take and themes from his record now accompany the 116 frames of action which allow you to roam around the whole of a desolate southern England under siege from the Martians.

You play the role of the journalist trying to survive and find out what the little green men are up to. You can use a joystick to control your movements as a text panel at the bottom of the screen tells you what your options are. In order to fit so

many frames of action in, CRL had to "compress whole landscapes into very little information".

It was Clement Chambers first encounter with the record industry and he found the book-sized contracts he had to sign intimidating.

When NEC introduced the £85 PC-201 battery-operated Centronics printer late last year it received an enthusiastic welcome from *Your Computer*. Now NEC has put it together with a tape recorder and the PC-8201 hand-held micro to make a go-anywhere system which weighs just 6lb — even if it costs £600.



New Dragons for our Fair

DRAGON IS LAUNCHING a new range of computers at our Computer Fair which opens at Earl's Court on Friday June 15. QIs will also be on display at this mixed hardware/software show backed by *Your Computer*, *Practical Computing* and *Computer Choice*. The Fair is open from 10am till 6pm Friday and Saturday and 10am till 5pm Sunday June 17. See pages 204-205 of this issue for further details.

Cheap games boom time

WHILE 99 PERCENT of the nation was enjoying this year's sunny spring, software house heads were doing a raindance. Every time the temperature rises games sales fall, as you throw your computers into the cupboard and head for the great outdoors. But companies like Mastertronic and Atlantis think they can beat the sales drought by dropping prices to £2 a time.

Mastertronic claims to have sold 250,000 cassettes in five weeks to unconventional outlets like newsagents, garages and even off-licences. Now Atlantis Software is following Mastertronic downmarket by launching a range of £2 games. If the price war takes off it could be a long hot summer for the established software houses.

"You just breathe out of time", he says "and you get done". The game of the record of the radio play of the film of the book will be available on Spectrum, Oric BBC, Electron, Commodore 64 and MSX. Anyone for posters and T shirts?

25 BBC MICROS TO BE WON!



WALL'S ICE CREAM AND ACORN COMPUTER INVITE SCHOOLS TO DEVISE A COMPUTER GAME

Here's a great chance to win one of 25 BBC Microcomputers (B) for your school.

To celebrate the launch of the new MegaBytes lolly, Wall's and Acorn are offering these superb micros free to winners of this 'Mega' competition.

The competition is open to all UK primary, secondary and special schools.

To enter, each school team must:

1. Devise a computer game program which features ice lollies and;
2. List as many words as possible using letters from the phrase: 'Wall's and Acorn'.

There is no limit to the number of

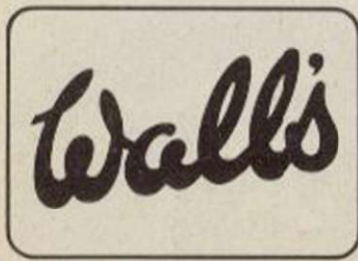
entries per school but each entry must be accompanied by fifteen MegaBytes lolly wrappers and arrive by 28 July 1984 at MegaBytes, PO Box 4XZ, LONDON W1A 4XZ.

Entries will be judged by a young computer games author and a team of professional programmers from Acornsoft. Points will be awarded for originality; quality of graphics; speed; sound effects; playability and overall presentation with attention to detail.

To win a computer, your school entry must have a high scoring game program and a sufficient number of words.

FULL RULES

1. Entries can be submitted on cassette or disk and written in either BBC Basic or machine code, each entry being signed by the teacher of computer studies or head teacher of the school. Entries should run on a BBC Microcomputer Model B or Acorn Electron.
2. All games must be clearly identified and accompanied by a full printed listing as well as a games catalogue style description of the game (not more than 200 words). The cassette/disk and listing should each carry the entrant's name and address.
3. Each school may only win one prize, irrespective of the number of entries of games submitted. Entries will be acknowledged upon receipt but not returned. Correspondence will be entered into at the absolute discretion of the promoters.
4. The entry instructions constitute part of the competition rules and are binding upon entry.
5. Responsibility cannot be accepted for entries lost, damaged or delayed in transit to the competition address. Illegible or altered entries will be disqualified, as will those not conforming to the entry instructions.
6. Entries will be judged by a panel of judges which will contain at least one independent member not connected with the promoter. The decision of the judges will be final and legally binding and in all respects of the competition the decision of Birds Eye Wall's Limited shall be final.
7. Copyright in all material entered rests in Paragon Communications on behalf of Birds Eye Wall's Ltd., and Acornsoft Ltd.
8. Winning schools will be notified as soon as possible after the closing date. A list of winners will be sent to anyone who encloses a stamped addressed envelope with their competition entry.
9. Entry is open to all qualifying UK residents except for employees of Birds Eye Wall's and Acorn Computer, their advertising and promotion agencies, or anyone directly connected with the competition or their families.





Rabbits may need MSX jobs to survive in British climate

RABBIT'S WRAPBIT II is a Z-80 based 80K Kong built machine due to arrive in our shops this autumn. Like so many other machines it has opted for a Z-80 plus the standard Texas graphics and General Instruments sound chips.

Rabbit's parent company in Hong

Kong, Foton is known to be negotiating to join the MSX club which has led to speculation that the Wrapbit might be MSXed before it is officially launched in this country. Rabbit claims that the £250 Wrapbit is Coleco-compatible and will have a CP/M option.

Case remains the same as CBM-16 replaces Vic

COMMODORE is replacing the aging Vic-20 with the 16K Commodore 16. In America the price will be \$100 which will probably translate to £90 if the 16 is launched here this autumn. But Commodore is famous for announcing products which never see the light of day — like the £100 Commodore Max announced

in April 1982, so don't hold your breath.

Although the 16 will come in the familiar Vic-20/CBM-64 plastic case it will be related inside to the new Commodore 264 micro now also known as the Plus 4 which will offer 60K free memory, built-in word processor, spreadsheet, filer and graph drawer programs for \$300 — £280. Any software for the 16 will run on the 264. Commodore expects to sell over two million computers worldwide this year.

Legal, decent honest...

UP FIVE PLACES in this year's Advertising Standards Authority bad boys chart go computer adverts. In 1982/83 there were enough justified complaints about misleading adverts by micro software and hardware companies to scrape into the ASA top 10.

This year's chart covering March 1983 to March 1984 has just been compiled and the bad news is that complaints about computer ads have overtaken Photography, Furniture, Services and Property to take the number 5 position. You don't need a micro to work out that at that rate of progress computers could soon overtake Finance, Travel and Holidays to topple cars and garages from the number 1 spot.

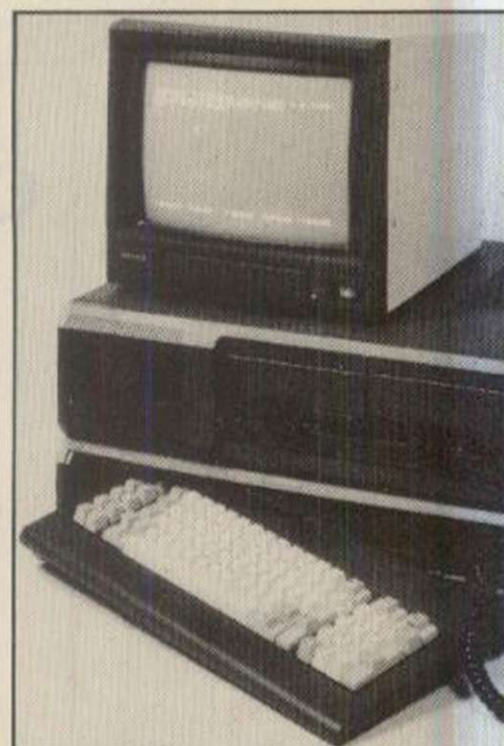
Sinclair, Acorn, Commodore, Dragon and Oric have all had complaints against them investigated and upheld by the authority. Most of the complainants claimed that the adverts were misleading or that products had not been delivered within 28 days. Peripheral manufacturers like Fuller were also criticised by the ASA.

Advance into IBM land try your discs at Smiths

AT LAST THE ADVANCE has gone on sale. Ferranti, who will be manufacturing the computer expects to make 100,000 this year — up to half of which could be sold in Britain by W H Smith.

For a fraction of the price of a PC the Advance is IBM-compatible which in this case means it will run most IBM programs — including Lotus 123 and Flight Simulator which often catch out IBM look-alikes. Advance director Jack Dangoor admits that a man who came to see him with a farming program that recognised cows on an IBM PC could not get it to run on the Advance so W H Smith will be encouraging potential customers especially farmers to try out any IBM software that they are thinking of buying on an Advance in the shop first.

Smiths will be selling both the cassette-based £400 Advance 86A, reviewed *Your Computer* May 1984, and the disc-based £1,500 86B. They both have an 8086 processor and 128K but the B also comes with two



disc drives, a word processor, spreadsheet, database and spelling checker.

Amstrad man puts his stomach on the line for delivery

WILLIAM POEL Amstrad's software division general manager is so confident that the CPC-464 will be out on time that he says: "I will be prepared to sit down and eat one in Trafalgar Square if its late. Dock strikes and Russian aircraft attacks permitting we will be in the shops in June." The *Your Computer* snatch squad will be waiting in the shadow of Nelson's column at dawn on July 1 in case Amstrad fails to make the deadline.

One *Your Computer* reader is already cutting his teeth at Amstrad. Alexander Martin's Da Vinci entry was commended in our April 1984 Design a Micro round up. It also



carried a personal message "Product design graduate — job needed". When he went for an interview with Amstrad soon after the magazine came out it helped him to get the job. "At the interview he waved a copy of *Your Computer* at us", says William Poel "and we'd seen it the day before so it was fresh in our memory."

Microvitec's new dual disc drive for the Dragon is not cheap — £525 — but it adds a massive 1 megabyte of storage, 720K formatted, to your 32 or 64. Microvitec is on 0274-390011.



YOUR COMPUTER TOP 20

Game	Company	Machine
<input type="checkbox"/> Blue Thunder	Richard Wilcox	Spectrum
<input type="checkbox"/> Chequered Flag	Psi-on	Spectrum
<input type="checkbox"/> Chuckie Egg	A&F Software	Dragon
<input type="checkbox"/> Demolator	Visions	BBC
<input type="checkbox"/> Eightball	Microdeal	Dragon
<input type="checkbox"/> Falcon Patrol	Virgin	CBM-64
<input type="checkbox"/> Flight Simulation	Sinclair	ZX-81
<input type="checkbox"/> Fortress	Pace	BBC
<input type="checkbox"/> Hunchback	Ocean	CBM-64
<input type="checkbox"/> Hunchback	Ocean	Spectrum
<input type="checkbox"/> Jet Pac	Ultimate	Vic-20
<input type="checkbox"/> Jet Set Willy	Software Projects	Spectrum
<input type="checkbox"/> Krazy Kong	PSS	ZX-81
<input type="checkbox"/> Mr Wimpy	Ocean	CBM-64
<input type="checkbox"/> Orc Attack	Atari	Atari
<input type="checkbox"/> Q Man's Brother	MRM	BBC
<input type="checkbox"/> Snooker	Visions	Vic-20
<input type="checkbox"/> Ugh	Softech	Dragon
<input type="checkbox"/> Wizard & The Princess	Melbourne	Vic-20
<input type="checkbox"/> Zaxxon	Centresoft	Atari

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THURSDAY JUNE 7th 10 a.m.-6 p.m.

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SATURDAY JUNE 9th 9 a.m.-5 p.m.



commodore

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If you're a business man, you can keep ahead of the times by visiting our seminars hosted by Jim Butterfield, the internationally renowned computer expert, or for advice, visit the Milton Keynes Information Exchange.

But don't miss Patrick Moore, who'll be on hand to demonstrate

the Commodore Astronomy software, and unravel the mysteries of the Universe. He'll also attempt to answer any questions under the sun.

The kids will have fun meeting B.J. the Bear, Gortek, and adventuring in the games arcade.

There's lots more to enjoy, including music from Radio Luxembourg, so be sure not to miss this year's show.

All these fun and games cost only £1 for a child, £2 for an adult, or £3 for a family of up to four.

But then the knowledge you'll gain is priceless.



I could do that...

For this month's task we would like you to equip your computer with a glimmering of artificial intelligence. Write a program which allows you to carry on a dialogue with the computer. It should start off by asking the user a question and then respond to the answer, keeping it up for at least four exchanges. The program should not be longer than 20 single statement lines, including data statements.

We will award the £15 prize to the program whose questions and responses are judged to be the most amusing, or apparently intelligent.

Program 1.

```
10 REM**DOT-MOVER**
20 MODE7
30 CLS
40 LET A=10
50 LET B=10
60 REM** A, B ARE START POSITION**
70 PRINT TAB(A,B);"."
80 IF INKEY="" THEN GOTO 95
90 LET C=INKEY$
100 PRINT TAB(A,B);"."
110 PRINT AT B,A;"."
120 GOTO 100
130 REM**LEFT=RIGHT=UP=DOWN**
140 IF C="5" THEN LET A=A-1
150 IF C="8" THEN LET A=A+1
160 IF C="7" THEN LET B=B-1
170 IF C="6" THEN LET B=B+1
180 IF A<1 THEN LET A=1
190 IF A>38 THEN LET A=38
200 IF B<1 THEN LET B=1
210 IF B>23 THEN LET B=23
220 IF B>19 THEN LET B=19
230 PRINT TAB(A,B);"."
240 PRINT AT B,A;"."
250 GOTO 100
```

A DISC OPERATING system — DOS — is simply a machine-code program — usually 8K long — which handles loading and saving to disc. Most home micros come without a disc operating system so if you want to add a disc drive you will also have to buy a disc interface with the DOS stored on ROM.

On the Spectrum, for example, the DOS for the Microdrive is supplied with the Interface 1, while BBC owners have to plug a DOS chip into the main board. Commodore, however, incorporates the DOS within the disc drive.

Business micros, by contrast, generally store the DOS on disc. They hold a short routine in ROM — a bootstrap routine — whose purpose is to load the DOS into RAM when the machine is powered

BEGINNERS

First Bytes

Starting out in home computing? First Bytes is for you. Just write to

Your Computer with any hardware or software problems, no matter how small or simple.

Logical operators?

"What exactly are 'logical operators' used for?"

MOST BEGINNERS don't take long to learn to use the relational operators. These are = < > <= >= and <>. Their use with arithmetic variables, such as:

110 IF Q<20 THEN GOTO 70
is soon extended to string variables, like:

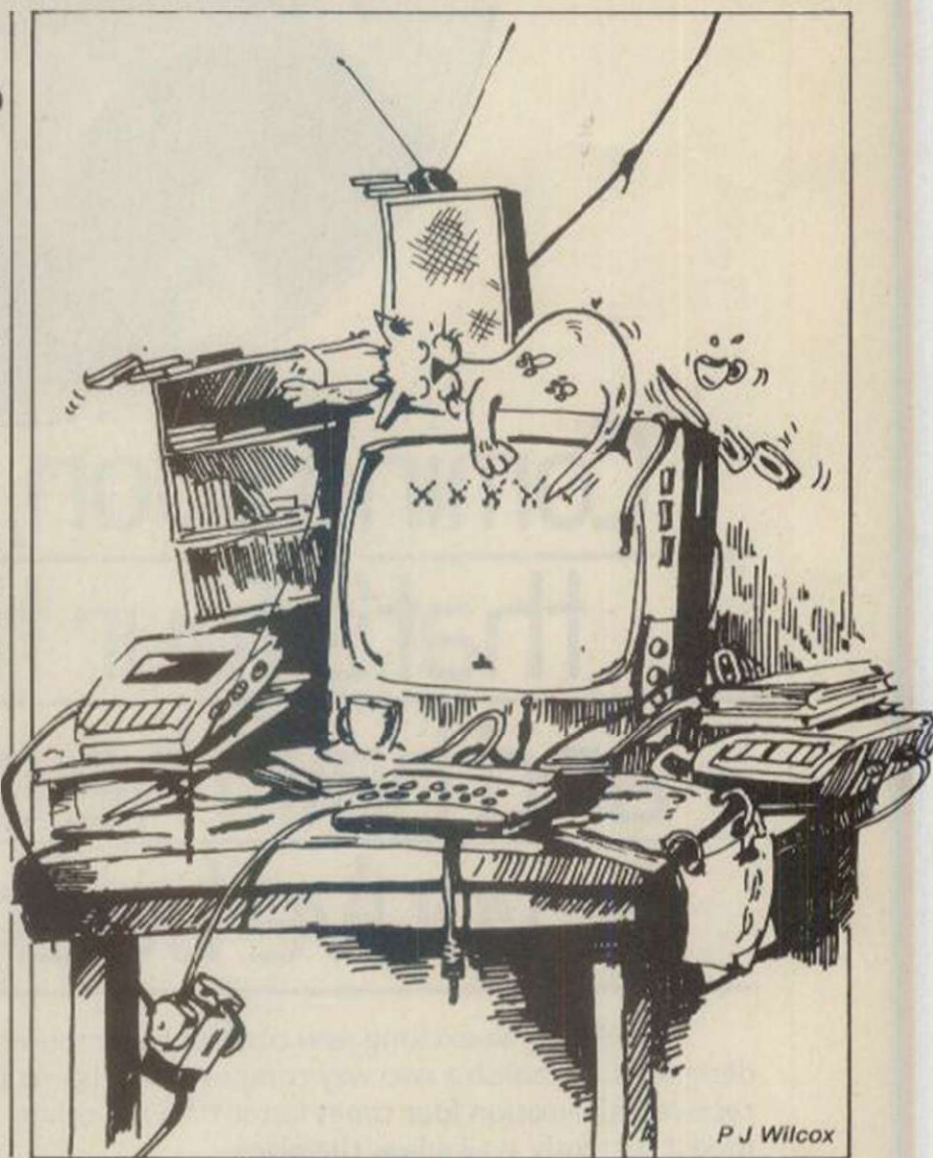
430 IF N\$="SMITH" THEN PRINT N\$,T\$

The use of logical operators such as And Or Not EOR takes longer to grasp. The problem is complicated by the fact that different micros use them in different ways, and the fact that the rules which underly their use come from one of the more obscure backwaters of mathematics; Boolean algebra. But whatever the theory, the use of Logical Operators can lead to very neat program routines.

Try the programs with this article. As printed, they will run on a BBC micro, a ZX-81 or a Spectrum, and they should be easy for beginners to modify them to run on many other machines.

The first program moves a star around the screen, leaving behind a trail of dots. ZX lines are in brackets.

(continued on page 51)



P.J. Wilcox

Disc operating systems

"What is a disc operating system and what does it do?"

up. This is the method used to run CP/M, by far the most popular eight-bit operating system.

Disc operating systems provide a far greater range of facilities than their cassette counterparts. Perhaps the most important difference lies in the way the DOS keeps track of what is stored on disc and where.

Consider what you have to do before saving a program to tape: you need to make a note of where other programs start and finish, and of how much space is left on the tape; you need to physically position the tape at the right spot. A disc operating system does all this for you.

It reserves space on the disc for a

directory in which it stores details of where programs are stored and how long they are. When you come to save a new program the DOS finds space for it and adds its details to the directory. If the disc is full it tells you so. When you load in a program the DOS consults the directory to find its location.

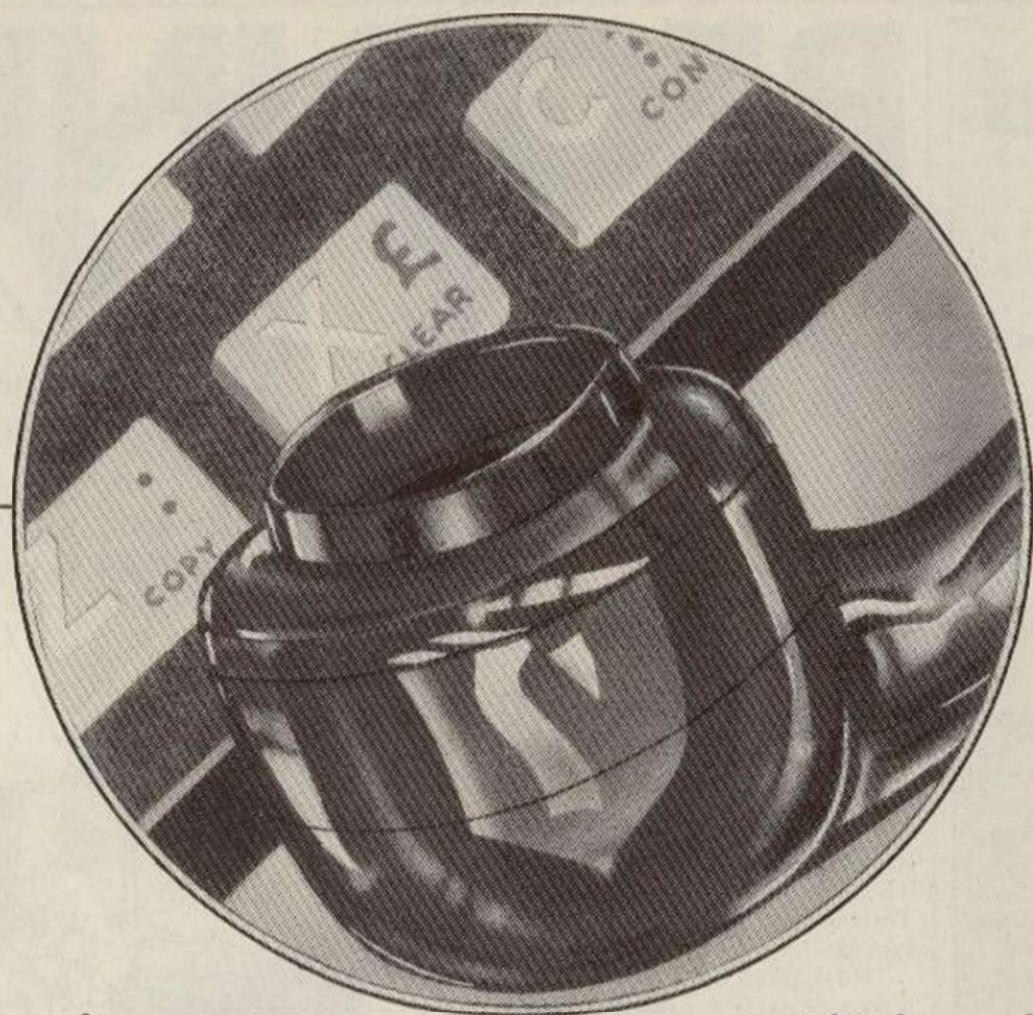
In this way the DOS performs what are often called its house-keeping duties. Not having to worry about such chores is one of the great advantages of disc systems over cassettes.

On top of this a good DOS will offer an extensive spread of commands and utilities. Naturally,

these vary from DOS to DOS. They should include commands to delete selected files on an entire disc, and facilities for copying files either to another disc drive or to another disc inserted in the same drive.

There will also be a set of commands for creating data files. These will allow you to read in a series of records — sequential files — or pull in specific records out of order — random-access files.

Other facilities may be for renaming programs, protecting them, setting up different program libraries, or tidying up the disc by rewriting files head to tail. To find out more you will need to take a look at a DOS manual. You may find that learning to use a DOS fully is almost as demanding a task as mastering the computer itself.



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(continued from page 49)

Look at program 1. Easy to follow, but all those If...Thens! Now erase lines 120 to 190, and type in the two lines in program 2 instead.

I hope you agree that this makes the program shorter, neater, and therefore better. ZX programs can be made even neater, but by using ZX Basic in a way which is not allowed on most other machines. 120 LET A=A+(C\$="8" AND A<31) - (C\$=...etc.

To follow the logic read line 120 as:

"Let A become A+1 provided C\$ is 8 and provided A is less than 38; and let A become A-1 provided C\$ is 5 and provided A is greater than zero."

Using OR needs much more care. With most Basics, watch out for double negatives — what your old English teacher said may have seemed pointless in everyday life, but

it really does matter here. Another ghost from the past; in most Basics, OR is like the "either ... or ..." comparisons of English, and compares just two things. Forget this at your peril! However, unlike English, in Basic you can string together logical operations using brackets. You can have:

```
340 LET K=K+(1 AND (C>7 OR C<19) AND L$<"")
```

Back to the little dot moving program. You can try changing lines 120 and 130, to allow you to move along diagonals — see program 3.

Experiment with the programs, and make sure you understand how the logical operations work. Next, look out for them in program listings for your own machine. That way you are likely to get some fresh ideas to use in your own programs. You may find examples of the use of Not. See if you can work out why they used this rather than <>.

Program 2.

```
120 LET A=A+(1 AND C$="8" AND A<38)-(1 AND C$="5" AND A>0)
130 LET B=B+(1 AND C$="6" AND B<23)-(1 AND C$="7" AND B>0)
(A<31 and B<20 with ZX machines)
```

BEGINNERS

first bytes

Program 3.

```
120 A=A+(1 AND (C$="8" OR C$="9" OR C$="0") AND A<38)-(1 AND (C$="5" OR C$="4" OR C$="3") AND A>0)
130 B=B+(1 AND (C$="6" OR C$="4" OR C$="9") AND B<23)-(1 AND (C$="7" OR C$="3" OR C$="0") AND B>0)
120 LET A=A+((C$="8" OR C$="9" OR C$="0") AND A<30)-((C$="5" OR C$="4" OR C$="3") AND A>0)
130 LET B=B+((C$="6" OR C$="4" OR C$="9") AND B<20)-((C$="7" OR C$="3" OR C$="0") AND B>0)
```

What are bit-mapped screens?

TO UNDERSTAND the idea of a bit-mapped screen you need only to remember that each byte of memory is made up of eight bits, and that each bit can have one of two values, 0 or 1.

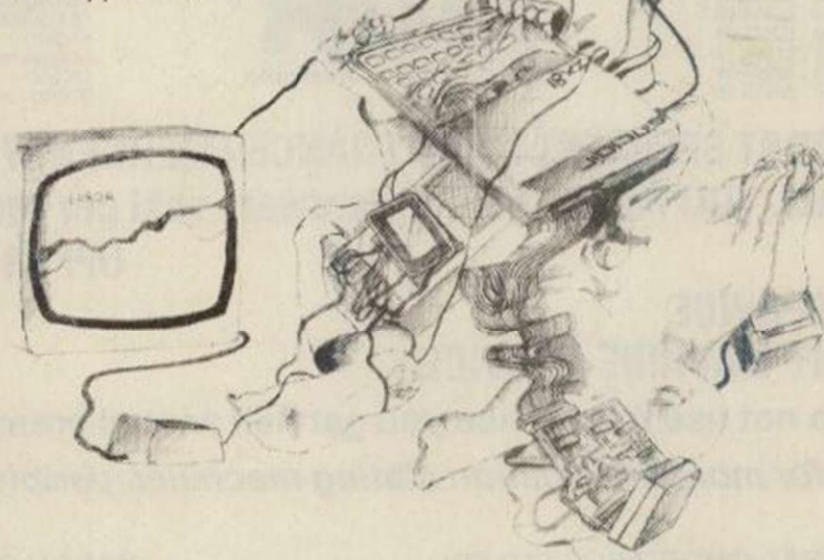
In a bit-mapped screen each pixel on the display is represented by a bit or several bits in memory. Thus the pattern of binary 0s and 1s in the screen memory copies the pattern of dots on the screen.

In the simplest case where a pixel can only have one colour — is either off or on — only one bit is needed to register the state of one pixel; so a line of eight pixels would be stored in the screen memory as binary 11111111, or 255 in decimal.

Bit-mapped screens permit higher resolution than character-mapped screens but consume much more memory. Characters are usually defined on an 8 by 8 grid of dots so storing the dot pattern for a character will require 64 bits which is eight bytes. Contrast this with a character-mapped screen where the code for a single character is stored in a single byte.

To work out just how much memory a bit-mapped screen will take up you simply work out how many pixels there are, allow one bit for each pixel and divide by either to find the number of bytes. Mode 0, for example, on the BBC gives a resolution of 640 by 256. Multiply these two numbers together and

"Would you please explain what is meant by a bit-mapped screen?"



divide by eight and you will arrive at a figure of 20480. Divide this by 1024 — the number of bytes in one K — and you finish up with 20K which is the amount of RAM used by Mode 0.

If you also want to store information about the colour of a pixel you will need even more RAM. If each pixel can have one of four colours including the background colour then twice as much memory is required since two bits now need to be allocated to one pixel.

This explains why on the BBC the four colour Mode 1 uses as much RAM as Mode 0 although it only offers half the resolution. There is trade-off here between colour and resolution: the more colour the lower resolution, and vice versa.

The Spectrum circumvents this problem by using an attribute file separate from the bit-mapped display file. Each byte in the attribute file contains the details of colour, brightness and flash status for all the pixels within a character space.

Although it minimises memory consumption the drawback to this method of storing colour information is that it means you can only have one colour within a character space. This gives rise to the effect — often noticeable in Spectrum games — of having blocks of colour from different shapes overrun each other.

A further complexity of bit-mapped displays is the way in which the bytes in memory are laid out in relation to the pixels on screen. You might think the simplest method was to have consecutive bits and bytes store the details of consecutive pixels running from left to right, row by row from top to bottom. But it rarely works out this way.

Poking consecutive bytes in the screen memory on the BBC fills out not a row but a character space at a time. The Spectrum's screen memory organisation is even more complex. The first 32 bytes correspond to the first row of pixels but the second 32 store the pattern of the ninth row down — the first row of the second character line.

All this makes dealing directly with bit-mapped screen memories — by Poking or Peeking — slower in Basic than using Plot or Print commands. Machine-code programmers, however, have no option, and one of the machine-code gamers' first tasks is to work out an algorithm for plotting to the screen.

Either way you can investigate the complexities of your screen layout by simply Poking the first thousand bytes of screen memory with 255. By noting the order in which the pixels fill up you can then observe your computer's screen organisation in action.

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If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

Llanelli

If you have a computer and are wondering what you can do with it other than play games, then Llanelli Computer Club is the place for you. Whichever make you have, there will be someone else with whom you can discuss and grumble about the different features of your machines. Anyone who is interested is invited to come along and see for themselves. The club meets every Friday evening at 7 pm at the Mutual Aid Shop, John Street, Llanelli. Contact Trevor Walters, or Ray Collins on 05542-56917.

Oxford

Neglected machines though they be a hardcore enclave of TI-99/4 and TI-99/4A users has formed in Oxfordshire. Oxon TI Users has a monthly newsletter called *TI-Lines* which has one unusual feature: it is read on to audio cassette for the benefit of blind/partially-sighted users. Contact Peter Brooks, 29 Kestrel Crescent, Blackbird Leys, Oxford OX4 5DY. Telephone 0865-64811, or 0865-717985.

Tyne & Wear

Newcastle-upon-Tyne Personal Computer Society meets at Room D103, Newcastle Polytechnic on the first Tuesday of every month. They try and organise some sort of demonstration every month. There is a wide range of machines from ZX-81s to sophisticated business machines. Contact Pete Scargill, 21 Percy Park, Tynemouth. Telephone 0632-573905.

COMPUTER

What do John Milton and browse options have in common? After a flying visit to the Chilterns Paul Bond is in a position to reveal all.

club

CHILTERN MICROCOMPUTER Club, held on the first Wednesday of every month at the Old Garden Centre, School Lane, Chalfont St Giles, Buckinghamshire has the unusual distinction of meeting not far from the home of John Milton, 1608-1674, of *Paradise Lost* fame. And while not exactly a feast of nectared sweets where no crude surfeit reigns, coffee and biscuits are nevertheless provided, to give people a chance to exchange ideas before the main business of the evening; usually a lecture or a look at some piece of computer hardware — either a new home computer, or perhaps a business machine that other club members are interested in seeing.

The club does not limit itself to any particular machine or interest area. Nevertheless, they have been in the unfortunate position of having to discourage younger members because, due to rural transport problems, this would necessitate meeting at an earlier time. It would also influence the nature of topics covered in the meetings.

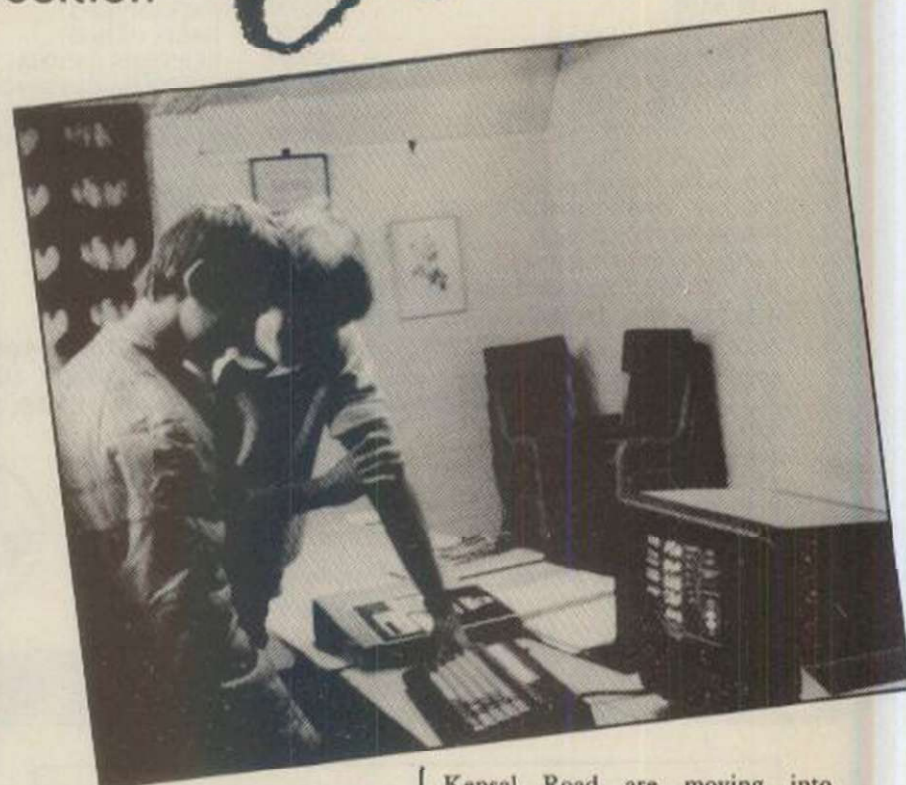
Wendy Tibbits, secretary of the club pending the annual general meeting, was also its founder. An ex-mainframe programmer, she now does freelance software writing from home so that she can devote more time to the family. She even advertises within the pages of *Your Computer*.

The club chairman, Ian Spedding, joined the club at its inception two years ago but was, in fact, standing in for his son who had gone to university by the time regular meetings got underway.

He explained that the club, apart from looking at every kind of machine from the Memotech MTX-500 to the IBM PC, had done things like organise an introductory seminar for people who had never written a single program instruction. Held in January of this year, the session dealt with very basic things like how to tune a television set into the microcomputer and worked up to a 15 instruction program which was worked through one step at a time.

Club members comprise a high proportion of people involved in data processing or business applications of computers — Ian Spedding himself is a systems analyst — but also people who are interested in micros purely from a hobbyist viewpoint.

The club also provides a bit of a



pressure group on the local schools who, it would seem, have been a bit slow off the mark when it comes to seizing the challenge proffered by new technology, letting those government grants for microcomputers just slip away. If teachers have a mental block against computers, their pupils will suffer.

Although the club does not print a newsletter, the noticeboard keeps it in touch with developments like Micronet 800's Freebie of the Month competition — a possible £100 prize here for BBC or Spectrum programmers together with the possibility of a club modem — for more details telephone 0733-63100. Also Interdisc Records of 249-251



Kensal Road are moving into software and want programmers subsequent to their deal with EMI and Island.

The evening's talk was given by Bob Finch, a local businessman. His field is really radio-electronics but he got into computing after getting a contract for a hospital radio system run by a PDP-11/05. "I had to learn to drive it." Shortly after this his children started computer studies at school so he went in for a BBC Micro.

The machine he used for most of his business purposes, however, was the somewhat more exalted ICL model 26. This could be run with two screens and two printers one dot matrix and one Olympia Typewriter. On this he did price-list, letters and accounts. He had customised a WordStar program, rewritten by a friend. It had softkey functions making it very user-friendly. Since the program is menu driven you can rename, copy, delete files etc.

For data management he used a program called Delta. This simply writes serial files on a disc. You have to define the key field — character, numeric, data — the record and how to get into the file. The program has a choice of five browse options. This means different parameters can be selected in order to locate things if you can't remember all the details. This kind of program is used by mail order companies. For more details of Chiltern micro club contact Mrs W Tibbits on 024 074906.

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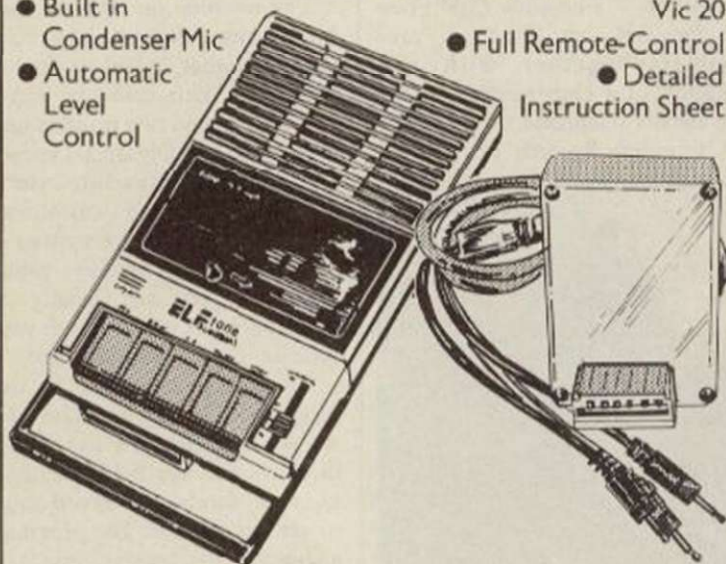
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Star★ chart

Zigzag

Spectrum 48K:

Novelty:

£6.95:

DK'tronics:

★ ★ ★

You must chase Scarabags in your Vectrakker DKT Mk II prototype and, once you've cornered one, interrogate it to find out how to enter the next sector. Then kill it. Occasionally, Hoverdroids appear and you must destroy these too. A 3D maze effect and speech module capability make this an unusual game. The Scarabags, quaking in a corner, made me feel sorry for them — I didn't exterminate many.

Ad Astra

Spectrum 48K:

Shoot-'em-up:

£6.95:

Gargoyle Games:

★ ★ ★

This game looks better than it actually is — the graphics are very good but the scenario is an old one. Blow up the alien hordes and survive the asteroids. At least the game is in perspective and this raises it above the standard shoot-'em-up fare.

Laserwarp

Spectrum 48K:

Shoot-'em-up:

£6.95:

Micro-gen:

★ ★

Destroy nine waves of attackers including Interstellar pogos and hyperspace chickens before encountering the Master — destroy his ship for bonus points. A slow and boring Galaxians-type game.

Croakit

BBC B:

Novelty:

£5.95:

Kerian:

★ ★

The cassette only version says on the cover card: "Probably the most exciting version of the well known arcade game". I disagree. The music is as boring as most, but the river traffic has a slight difference.

SOFTWARE

Night Gunner

■ Spectrum 48K

■ £6.95

■ Digital Integration

★ ★ ★

FROM THE PEOPLE who brought you the excellent Fighter Pilot F-15 Eagle simulator, this program obliquely relives the experiences of a World War Two air-gunner on a bombing mission over enemy territory.

Three types of mission are available. First you defend the bomber from nightfighters. Twin engine aircraft swoop towards you as you manipulate the keyboard/joystick to get them in your sights. The delicate tracery of bullets weaves a fine mesh of death in the night sky. Oops, getting carried away there.

There is also a variety of ground attack options. As you unleash your cargo of destruction on the unsleeping factories of the enemy your view of the terrain is occasionally obscured by clouds. You can manoeuvre looking for a break in the cloud-cover.

The ground attack display shows you planes and sometimes lorries on the ground. You strafe them mercilessly with rockets, but watch your altimeter in case you turn your plane into a rather expensive lawnmower.

Plane damage is caused by attack from enemy aircraft or being hit by flak on the bombing runs. The plane's status panel at the bottom of the screen displays damage on an aircraft symbol. Time to target or end of mission are also displayed in seconds as is time remaining during ground attack. You periodically get messages from the captain during the mission.

Damage to the flight deck results in random movement of the aircraft making it difficult to hit your targets.

The sight on the ultimate mission is

Dyslexia Beater

■ Spectrum 48K

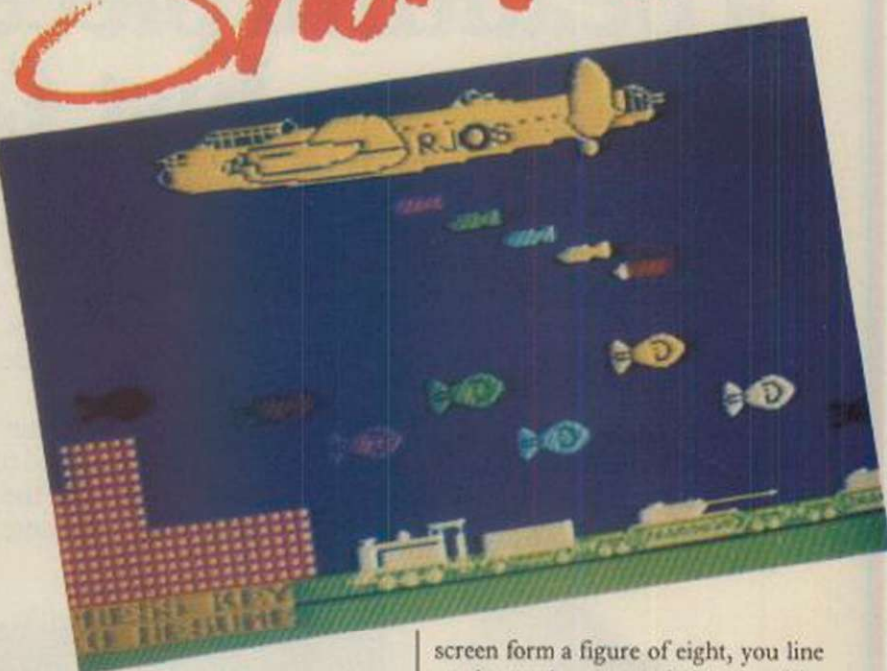
■ £9.95

■ Dunitz Software

★ ★ ★

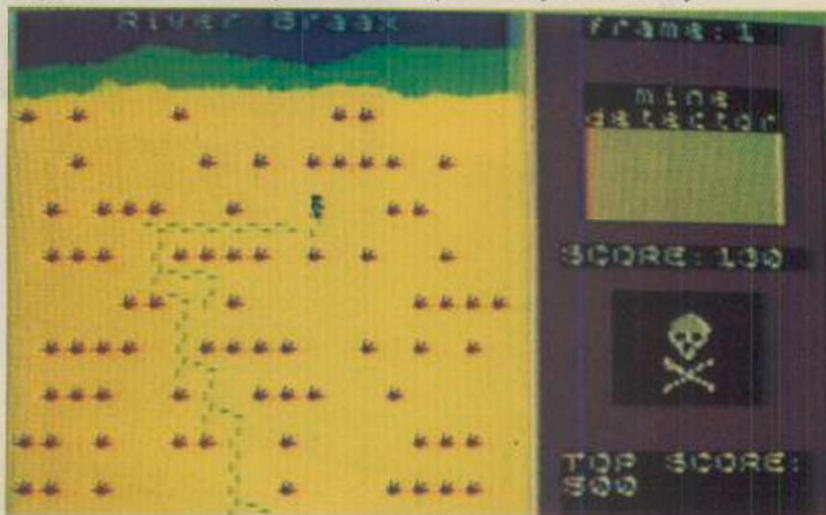
"SIGNIFICANTLY, MANY of the programmers I have met seem to be dyslexic to some degree." Thus Dr Beve Hornsby in her new book *Overcoming Dyslexia*. The relevance to this column is that Dyslexia Beater is a series of three addictive, easy-to-play arcade games created by educational psychologist Dr Colin Terrell and his colleague Charles Smith designed to accompany the aforesaid book.

The programs aim to help youngsters develop good letter recognition skills and sense of direction. Directional confusion from being uncertain of which is left and right to being unable to read properly is a common symptom of dyslexia. It appears to be



different from the others, in true Barnes-Wallis style. Adjusting your height so that the two spots on the

screen form a figure of eight, you line up the two bars on to the centre of the towers and release your bomb. Barrage balloons and bonus planes periodically cross the sky.



a hereditary condition.

The first game, Desert of Durg, appears to cater for directional confusion. You have to guide Dyslexia Beater to the River Braax, avoiding mines and, on later screens, monsters. It is a standard format game of the type that presents you with a map of a minefield. You tiptoe round this using the keyboard. Then you have to do it again — but this time the mines are invisible. You have to follow the instructions which are displayed on the right-hand side of the screen. They warn you that mines are to the right, left, above, below. The pink monsters which appear later mean you have to do a bit of strategic thinking to figure out how to avoid them.

Crossing the Braax is the second game. This deals with letter recognition. You build a bridge by catching letters falling in yellow boxes that are the same as your moving target or letter-catcher. Each correct catch builds up an arch, scores 30, erases the falling letter's yellow box and changes

the letter you are using to catch identical letters with.

This is an excellent idea and quite a good game in its own right. The only quibble I have is that it might be a little wearing on the eyes, due to the Spectrum's character set. If you are seriously going to use this with dyslexics, you will have to get hold of a big monitor.

The third game, Escape from Dyslexia, necessitates steering Dyslexia Beater's rocket ship through the green space gates, while observing direction instructions — a kind of primitive Scramble with the computer playing backseat driver. You get vaporised if you are hit three times by stars or the red space wall. The program is menu-driven so players can access any game at the touch of a button. The price of book and tape together is £12.95. The telephone number of Martin Dunitz Ltd is 01-482 2202.

(continued on page 57)

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Star★ chart

Submarine Strike

Spectrum 48K:

Novelty:

£6.95:

Pulsonic:

★★★

Hi there! Good shooting captain! Enemy plane Destroyed! Variable not found, 7410:2. These are just some of the messages that greet you as you play this simple game of submarine warfare. You get the standard instrument display, map display, periscope display. You shoot down enemy planes — don't forget to load — and also sink tankers, flat-tops, etc. You have to aim off to the left for some reason which adds an element of trickiness.

Knight Driver

Spectrum 48K:

Racing:

£8.95:

Hewson Consultants:

★★★

A breakneck racing game which gives you a downward looking view of a tortuously-twisting race track. Accelerate, decelerate turn accurately left and right. Don't hit anything.

Good for your reflexes, but I found I tired of it somewhat rapidly.

Jammin'

CBM-64:

Novelty:

£6.90:

Task Set:

★★★

A real blaad claat of a computer game, this ethnic little number has you guiding Rankin' Rodney through the top 20 mazes to number one. Done out in true Rastafarian colours plus blue for some reason, the maze is divided into four sections. You have to collect instruments from the four corners of the display and return them to the centre of the screen, avoiding spiders and bum notes, and voodoo skeleton men.

A simple idea, elegantly implemented. Avoid overconfidence. The harder they come, you know?

(continued from page 55)

Frogger

Atari

£34.95

Parker

★★★★

BRILLIANT GRAPHICS, increasing complexity and enhancement of game interest factors — it's all here and at this price so it jolly well ought to be. Parker are very cagey about how much this cartridge is likely to retail for, so you might see it around for £29.95. But still — you can buy a whole computer for that much.

The object of the game is to hop as many frogs across the road and the river to safety as you can. This cartridge will fit into Ataris 400, 800 or XL and then you are plunged into life in the fast lane with a vengeance. When the music starts, the time band at the base of the screen starts to shrink. Your amphibian will become an ex-frog if he touches any vehicle in the four lanes of traffic; and when it comes to crossing the river, treacherous turtles sometimes submerge — apparently this frog cannot swim. As the game progresses, some of the logs become alligators hungry for frog appetit. Alligators' heads also show up in the home bays occasionally. After you get five frogs home, the game continues at a higher level — speed and density of the traffic and river objects start to vary and snakes slither along the logs and pavement.

The game, of course, has some basis in fact. Ecologically-minded people in Norfolk have formed toad patrols.

Q-bert

Atari

Parker

£34.95

★★★★

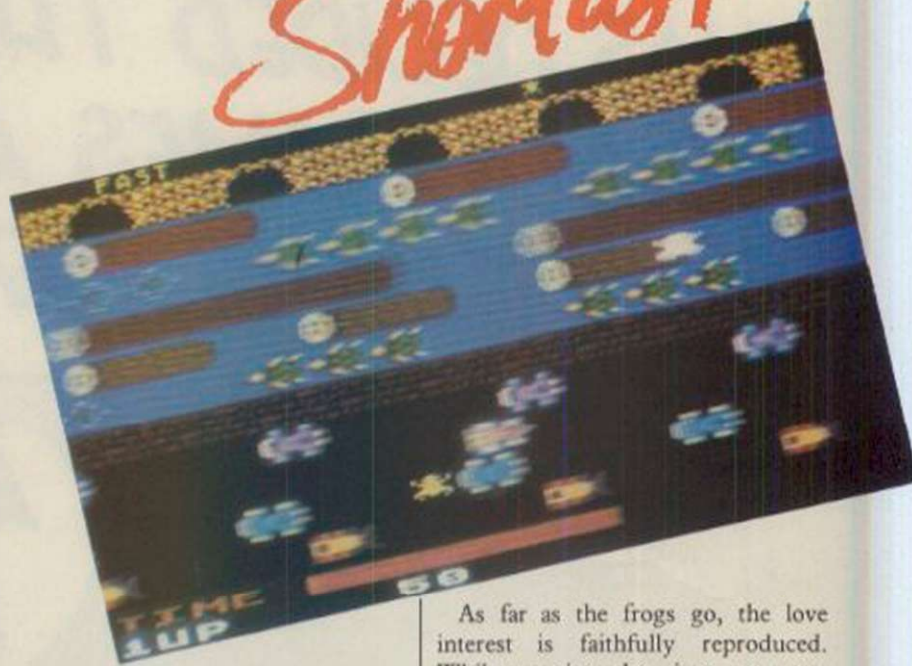
THE ONE, THE only, the original Q-bert — or at any rate the one under license from Mylstar Electronics Inc this game for MC Escher freaks shows a screen display illustrating a pyramidal assembly of cubes like a pile of playbricks. Your goal is to score as many as possible by changing the colour of the cubes on the pyramid from a starting colour to a destination colour. You do this by hoping the ovoid Q-bert from block to block. The idea is to change the whole pyramid to the colour shown at the left of the screen.

He has to avoid hopping off the sides or the bottom of the pyramid or else he is lost. Meanwhile, keep a weather eye out for Red Balls who is liable to squash Q-bert and Purple Ball, who does the same plus hatching Coily the Snake at the bottom of the pyramid.

In a real emergency Q-bert can hop onto a flying disc, the number and position of which differs according to the level of play. Other characters include Ugg who travels sideways and up and jumps on people, Slick who confuses the issue by re-changing the colours of the cubes, and finally Green Ball. If Q-

SOFTWARE

Shortlist



Apparently toads need a large flat area when croaking out their mating call and, unfortunately, lots of them choose six-lane motorways with the result that they become road pizzas. The well-meaning toad-lovers carry them singing off the motorway in sacks. I bet the toads are pretty confused.

As far as the frogs go, the love interest is faithfully reproduced. While crossing the river, you can score extra points by hopping on to a pink lady frog and escorting her home. Should there be a fly in your home bay when you hop into it, this will also score extra points.

This is one of the few frogger games that has managed to hold my interest for more than a few minutes — it is well-designed and enjoyable to play.



bert can catch Green Ball he freezes all the other characters, scoring extra points. The round ends when the pyramid has changed colour completely.

If you have any lives left, you progress to the next round — and the game speeds up. What makes this game the element of planning of strategy. You can't really just hop around and hope to achieve something worthwhile. For a start, after level 2 you don't just change the cubes from their start colour to their final colour. There is an intermediate colour stage to go through as well. After this the sequence of changes becomes ever more complex. There are nine levels of play. The graphics are clear and well-designed, not without a certain humorous appeal.

For example when Q-bert is struck down by the cruel twists of fate, not to mention the purple balls he utters, in the form of a speech balloon, that

primal scream which can only be represented by squiggle exclamation mark hash sign question mark squiggle. Whatever this word is, I have yet to hear it on Channel Four.

Pedro

Dragon 32

£5.50

Imagine

★★★★

ALSO AVAILABLE for the Spectrum, this program as implemented on the Dragon creates a most impressive screen display, reminiscent of the three dimensional maze game Ant-eschier — only you cannot move any deeper into the maze than is already shown on the screen.

Pedro is a gardener South of the Border — the herbaceous border, presumably — but his garden is a great attraction for all the local life-forms.

To deter creatures from eating his
(continued on page 59)

**THE ZARAK SOFTWARE COURT
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'An extract from the Zarak's Software Court Ruling'

CRL programs are so good it has become necessary for us to eliminate the entire range of CRL's software programs, from their no. 1 seller 'Glug Glug' to the mind blowing 'Omega Run' which are available for most of the popular earthling computers. Programs must be vapourized at Boots, Menzies, W H Smith's, Spectrum Group and any good computer shop — we must do it soon — tomorrow might be too late!

John Menzies



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Star★ chart

Staircase Stampede

BBC B:
Novelty:
£5.95:
Comsoft:
★ ★ ★

A very fast Q-bert game. There is a veritable outbreak of these on all machines at the moment and there is not much more to be said about this one. It is colourful, gripping and grows in complexity and speed as the game progresses.

Gun Fight

Unexpanded Vic-20:
Shoot-'em-up:
£6.95:
Sumlock:
★ ★

The sort of game that gives hi-res graphics a misleading name. Nevertheless plenty of fun to be had as you steer your gunfighter around the screen trying to take out the opposing son of a gun who appears to have about as much sense of direction as a decapitated chicken. It is obviously your duty to the public to shoot him since he is wheeling around the desert obviously the worse for tequila.

Microbot

Spectrum:
Shoot-'em-up/maze:
£5.95:
Softek:
★ ★

You are a disgruntled droid who would rather have been a truck driver than a brain surgeon: debugging the large positronic brains of the new batch of QT robots is very risky. Left screen displays a map showing the 12 sectors of the robot brain. Below this are readouts showing damage status and power level. You destroy blue bugs with blue fix-a-tive balls, and yellow ones with yellow ones. You also can drive them away for a bit with repulsa blobs. Colourful with good graphics.

(continued from page 57)

herbs Pedro must collect bricks or compost from the bottom corners of the screen and block the maze exits.

The game is joystick-compatible, but the keyboard arrangement is reasonably sensible. Any key on the top row or the space bar will enable you to jump on the marauding pests — Pedro must have big boots because he seems to be able to jump on ants or elks with impunity. Should you be standing close to heaps of bricks or compost, or the seedbox, pressing these buttons will enable you to pick them up.

The keys to move left are all on the bottom row, beginning with Z and alternating. The remaining keys enable you to move right. To go up any of the keys on the third row up may be used, to move down any of the keys on the second row up may be used. At the end of each level a bonus is calculated.

SOFTWARE Shortlist

If any of Pedro's prize blooms fall victim to the local fauna, he has to plant new seeds. This task is aggravated by a tramp who wanders on and tries to steal the seeds. This unsavoury character appears on the screen at random intervals, homing straight in on the seed-box. He is quite easily frightened away, so you do not have to trample on the tramp.

So a thing still most rare in Dragon software; amusing colourful graphics and an absorbing and taxing game.

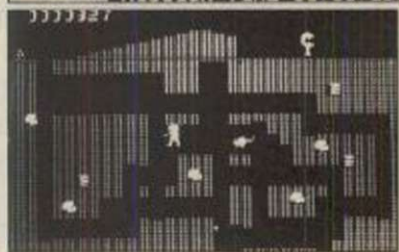
Aviator

■ BBC Model B
■ £14.95
■ Acornsoft
★ ★ ★

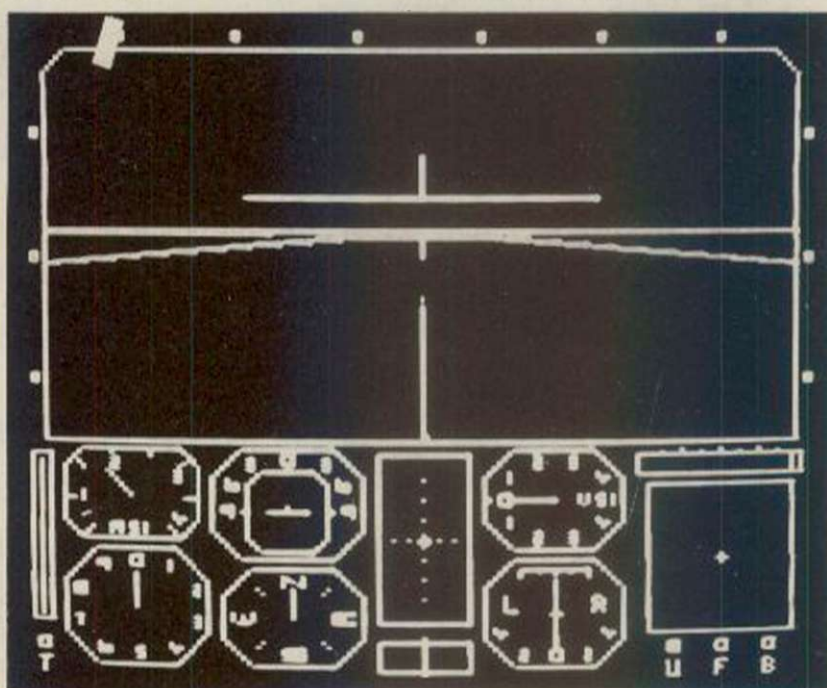
OFF WE GO INTO the wild blue yonder, or rather, in this case, the wild black yonder. Yes, it's one of those games where they have apparently sacrificed colour for hi-res graphics. The difficulty with flying around a load of white lines on a black screen is that you are apt to forget where you are and fly straight into the perimeter track thinking it to be the horizon. Of course this would not happen if you were sensible and took a close look at your instruments.

There are instruments galore in this program — Acornsoft have made much capital out of getting a real Battle of Britain ace to promote the game. The aircraft simulated is a Spitfire II — and, given the lack of colour, there are some very nice touches like the way your nose pitches down once the airspeed has built up enough to lift the tailplane clear of the runway. A little unnerving for our experienced shuttle pilots.

Documentation is unhelpful. There's no point in making a complex game more complex by not giving you a clear straightforward example of a standard training flight telling you which buttons to press in order to do a few circuits and bumps. There is a bridge for you to fly under in this game.



The great American Gold Rush started in 1849 when everybody rushed to the West Coast to look for gold, according to Software Farm. None of these people can have got very rich because the big '49 gold strike was up north in the Klondike. Still historical accuracy is not at issue here because giant rats and vicious gremlins have never been regarded as common hazards to gold miners, either.



Sea Wolf

■ Sinclair ZX-81
■ £5.95
■ Stephen Hartley Software
★ ★ ★

GIVEN THE limitations of the machine, an excellent little submarine shoot-'em-up. Two screen displays: periscope display, accessed by pressing P, shows you the familiar endless borderline between sea and sky. Over the horizon lurk the hostile ships of the enemy.

To torpedo a target you must find the ship in the periscope and turn the submarine until its heading is identical with the bearing on top of the periscope display.

On the left hand side of the screen throughout are displayed heading, depth, speed, and whether or not the snorkel is open or closed. Power being used and air left are also indicated. You can recharge your air supply in the time-honoured way by surfacing and using your snorkel. When you fire two white squares shoot off toward the somewhat crude representation of a surface vessel, which explodes and disappears.

The real expertise in this game seems to be figuring out the heading on which you must travel from the radar display. The heading can also be changed by turning the rudder — press keys 8 or 5. The longer either key is held down the more the rudder turns.

This kind of simulation of the inertia of a large submarine vessel is a nice touch in a game implemented on what, with the best will in the world, must be described as a primitive machine.

Forty Niner

■ Sinclair ZX-81
■ Software Farm
■ £5.95
★ ★ ★ ★

A GAME SIMILAR in format to Dig-Dug, but for the black-and-white ZX-81, which can justifiably claim to have hi-res graphics and quite interesting, nay, recognisable ones at that. At least once you've read the useful cassette inlay which has a diagram numbering the 11 different features of this games program, you'll be able to recognise the players in this tense underground tragedy.

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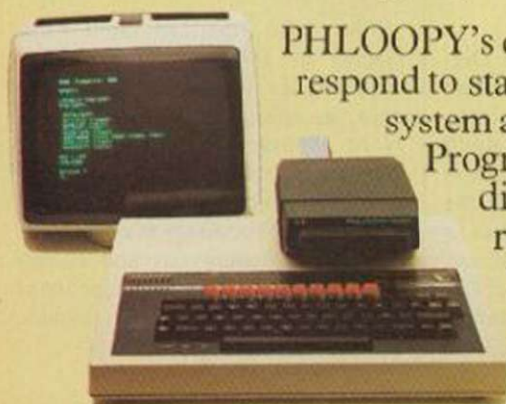
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NEWS

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The crystal ball

Help is at hand for those thousands of adventurers who have not yet managed to complete *The Hobbit*. Shining brightly amidst my newly delivered batch of spell volumes is a splendid new tome from Melbourne House entitled "A Guide To Playing *The Hobbit*". Priced at £3.95, the book gives vital guidance on strategy and tactics together with essential information to help in solving all the *Hobbit*'s dark secrets. A sorely needed book and an absolute must for every owner of this very successful adventure.

An itch in my palm tells me to expect a new adventure from Shards Software, a "pre-quel" to the unusual Pettigrew's Diary and possibly to be called *Operation Sasfras*.

My raven reports that Phipps Associates have released a new text and graphics adventure for the Spectrum — *Colditz* is its name.

The tea leaves distinctly indicate that a text and graphics blockbuster for the Commodore 64 is about to be released from Prolific English Software. Watch this space.

A helping hand

One of my favourite brain-bogglers is Acornsoft's *Philosopher's Quest* for the BBC Model B. It is choc-a-bloc with cunning puzzles and sadistic surprises. Perhaps you are having trouble getting past the Portcullis then into and out of the danger room. If so, here's the way to get in:

HTRON PMUJ NEHT
TELUMA BUR

And the way to get out again:

HTUOS NUR DNA
KSAMSAG TEG

Stymied by a serpent on a box in Phipps mind-stretching *Knight's Quest*?

EPOR A OTNI SNRUT TI
EKANS ELGNARTS

QUEST

Corner

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.

Pub Quest

Commodore 64
£5.95
Dream Software

THERE ARE MANY underground settings for adventures but I do not think I have yet seen one where some of the action is set in a sewer system. It would be a pity if that sort of environment puts you off since *Pub Quest* turns out to be an unusual, testing and quite funny adventure.

To pay off the massive debt you have managed to build up at the local hostelry, you must somehow quickly accumulate some money. You realise that there is likely to be quite a bit of cash down the nearby drain since most of it was originally dropped there by you while inebriated.

Your journey starts by the main street outside the pub. Cross the busy road at the wrong place and you will find your body covered in tyre marks — end of mission! The Pelican crossing is none too reliable, either. You may well find yourself up a tree — getting down is another matter.

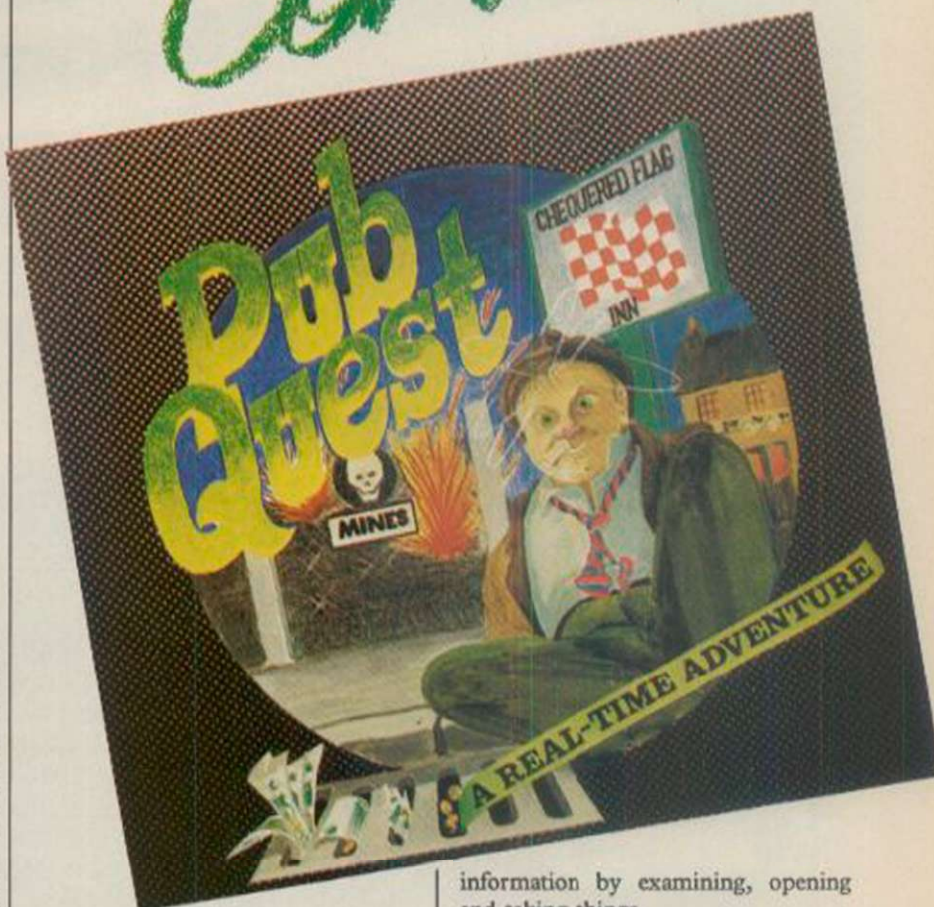
The game has quite a few tricks and surprises in store. Although there are one or two spelling mistakes, in general it is an enjoyable and engrossing program.

If you are feeling a bit jaded, this is an adventure to liven up your liver and tickle your funnybone.

Quest for the Holy Grail

48K Spectrum
£5.95
Dream Software

IF YOU HAVE seen the Monty Python film of the same name, you will have an idea of what this adventure is about. Included in the plot are such creations as the Knights that go "Nic!" — always on the lookout for a nice shrubbery; an extremely unpleasantly behaved French Guard; a



ferocious white rabbit and a three-headed knight.

The adventure offers both text and graphics, the latter being fairly simple pictures of each location. There are plenty of locations but not very many objects or characters. The "Save/Load Game" feature is very fast, making it little bother to save a position at any perilous point.

The quest is rather easy to complete and as such is more suitable for the novice adventurer.

Pettigrew's Diary

BBC B/Dragon
£9.95
Shards Software

BBC MODEL B owners may now give three cheers — one of the most original adventures on the market, *Pettigrew's Diary*, is now available for their machine.

On the cassette are three separate programs, each one a sequential chapter linked by the mysterious diary. Successfully completing one of them provides you with a password into the next — without the vital word you cannot progress further. Some pretty good theme music introduces each section of the adventure.

Chapter 1 is mainly graphic. You are inside a burning farm house where you move around and try to collect

information by examining, opening and taking things.

London Frolics is the title of chapter 2. This is more the traditional text adventure, except that the action takes place in real time and the text is delivered in teletype style. Here you wander around London, visiting interesting people and places in your search for more information. Beware — some characters may not be what they seem to be...

Chapter 3, *European Trek*, is a series of eight different challenges on a range of abilities. These include getting Pierre down from the Eiffel Tower and discovering who the best German barber is.

Completely original and highly intriguing, *Pettigrew's Diary* will give your grey matter a thorough workout.

June 13th

At last the mysteries seem to be unfolding before me. Very soon, I sense, the ultimate secret will be mine. But also, I can sense the evil forces closing in. Every day they seem stranger. It is my duty, then, to maintain this journal of events, so that it may guide he who may follow, if anything should happen.....

DISK GAMES

FOR THE **commodore** 

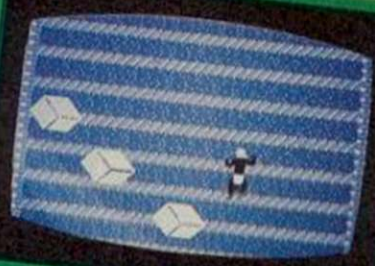
If you've got a 1541, you don't want to spend ages waiting for cassette games to load. Freed from the restraints of loading times, Audiogenic Disk Games can give you typically around 30K of machine code! More code means better games, better graphics and sound, more variation, and those little extra touches that you will come to expect from a game. Here are our first great releases!

FORBIDDEN FOREST

Forbidden Forest is more of a quest than just a game! The action takes place in a four dimensional scrolling forest landscape which many have entered, but none has returned. Yes, I did say FOUR dimensional - day fades into night as the action unfolds! The quest is to seek out and destroy the Demogorgon, mystic ruler of the Forbidden Forest. Before you can even set eyes on him you will have to contend with his army of fearsome creatures, including mutant spiders, showers of giant frogs, snakes, dragons, skeleton soldiers and more! You have only your trusty bow and arrows to depend on!



*



AZTEC CHALLENGE

A challenge on an epic scale! Aztec Challenge takes you on a journey to Mexico and the ancient pyramid of Tenochtitlan. The ancient Aztec gods and their devotees have ensured that no ordinary human can learn the secrets of the temple and live to tell the tale. The pyramid is protected by all manner of treacherous traps and hidden perils - an epic test of your courage and cunning. Aztec Challenge features no less than seven totally different screens - here are just three of them - each of which presents a brand new challenge. We hope your joystick can stand up to it!

*

SLINKY

Slinky, the spring, was having fun hopping about when suddenly he came upon a pile of coloured blocks, so he thought he'd play around on them for a while. Much to his amazement he found that they changed colour when he landed on them. Wow! But unknown to him, the blocks belonged to the Wicked Wizard, who sent his friends along to tease our poor hero. Slinky is a real fun package with ninety-nine levels, amazing reward displays, and action replays. Where else could you meet such charming characters as Dusty the dust cloud, Marge the magnet, Ralph the random raindrop, and Lorenzo the chameleon hopper?



*

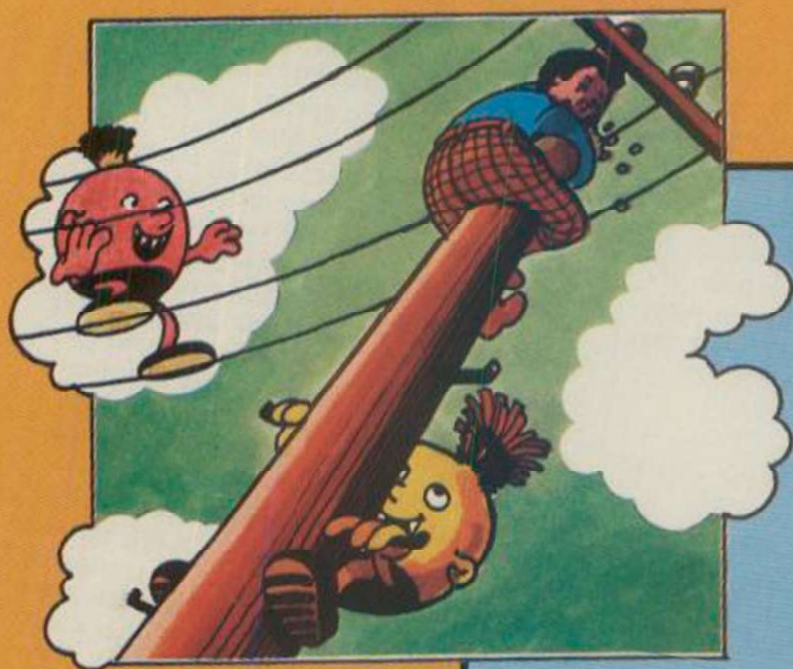
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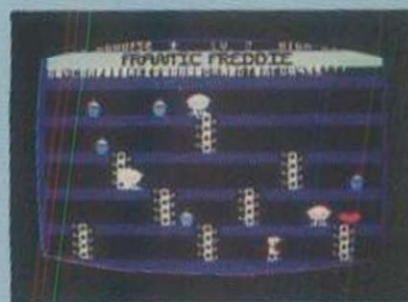
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Audiogenic!



FRANTIC FREDDIE

Frantic Freddie is fun all the way! Played to an unbelievable soundtrack of brilliantly arranged tunes, Frantic Freddie contains all the ingredients that make a game into a classic! Freddie is a telephone line engineer who has to climb up and down the telegraph poles, picking up pots of gold and avoiding the dreaded Greeblies. The Greeblies take on a different form with every new screen, but one thing's for sure - they may look cute, but they show no mercy! Frantic Freddie also features wacky messages, funny interludes and silly bonuses. Frantic Freddie - a game with a sense of humour!



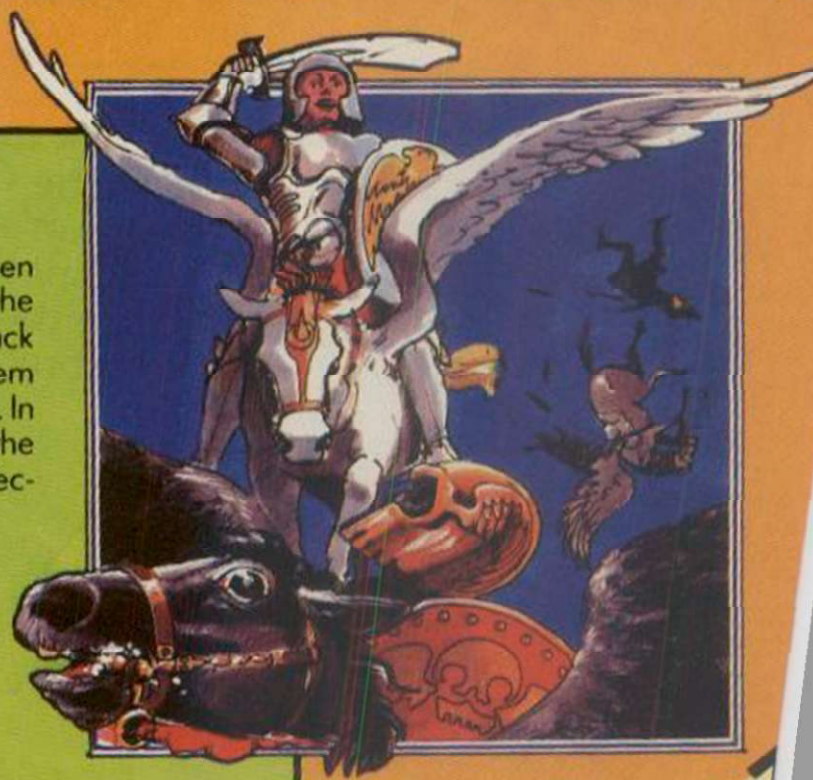
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PEGASIS

Pegasus takes us back to the mythical age when the battle between Good and Evil was fought by heroes on winged steeds. As the champion of the forces of Good, you must topple the evil Black Warriors from their jet black flying horses by swooping down on them from above, then land and finish them off before they can remount. In order to keep airborne, you must keep your wings flapping with the



joystick Fire button, and control direction with the stick. The brilliant programming of Pegasus gives you stunning graphics, bonus creatures, great wing flapping sound effects, an incredible simulation of flying horse aerodynamics, plus - two players can play at the same time!



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REVIEW

QL'S DARK SECRETS

SINCLAIR'S QL RAISES a number of questions. Why was it announced so prematurely? Is it worth £399? Is the "free" software of any real value? And so on. The 128K QL has been surrounded by misinformation since the beginning. And Uncle Clive — no stranger to criticism — has come in for more than his usual share during the first four months of this year since the announcement of the machine in January.

In this review, I will attempt to provide answers to some of the questions I've raised. Most computer reviews concentrate on the machinery, the hardware, and leave the ideas which lie behind the machine, the concepts the designers tried to embody in it, for other, later commentators to examine. But the

concept of the QL, and the ideas which lie behind its resident language SuperBasic are fundamental to understanding the machine, so they must be discussed, along with the hardware.

Strange rumours

"Those who operate at the cutting edge of technology shall be sacrificed upon it," observed Adam Osborne, and Clive and his staff have been proving the truth of that pronouncement since QL launch day — extraordinary delays in delivery; strange rumours that, perhaps, the machine might never even appear — the QL attracted a lot of flak. I was amused to see that internal Sinclair documents on the QL referred to it as the ZX-83. We all thought of the Spectrum, before its launch, as the ZX-82, and I guess now that that was also its working designation within

Sinclair Research. As a way of compensating for delivery delays, and lost interest on money forwarded for the computers, Sinclair are sending out the RS-232 lead — normally £14.95 — as a "free gift" with all QLs which have taken longer than 28 days to deliver. This will happen even if your QL was ordered via credit card, and the amount was not deducted from your card until the computer was sent out. If you had, in fact, ordered the RS-232 lead, Sinclair will send you £14.95 back.

One of the reasons for the delivery delays will be evident if you get one of the first several thousand machines sent out. The QL does not fit within its natty dark-grey case. "We can't get all of the operating system in," a spokesman confided. So sticking out of the ROM socket at the back of the QL is a blob of metal, slightly larger than a matchbox, which contains the bits of the computer which Sinclair could not squeeze into the case.

Eventually, QLs will be going out without the extra blob at the back, but Sinclair felt it was more important to quiet the clamour over protracted delivery delays — even if it meant sending out cobbled together machines — than it was to delay the whole thing until they got it right.

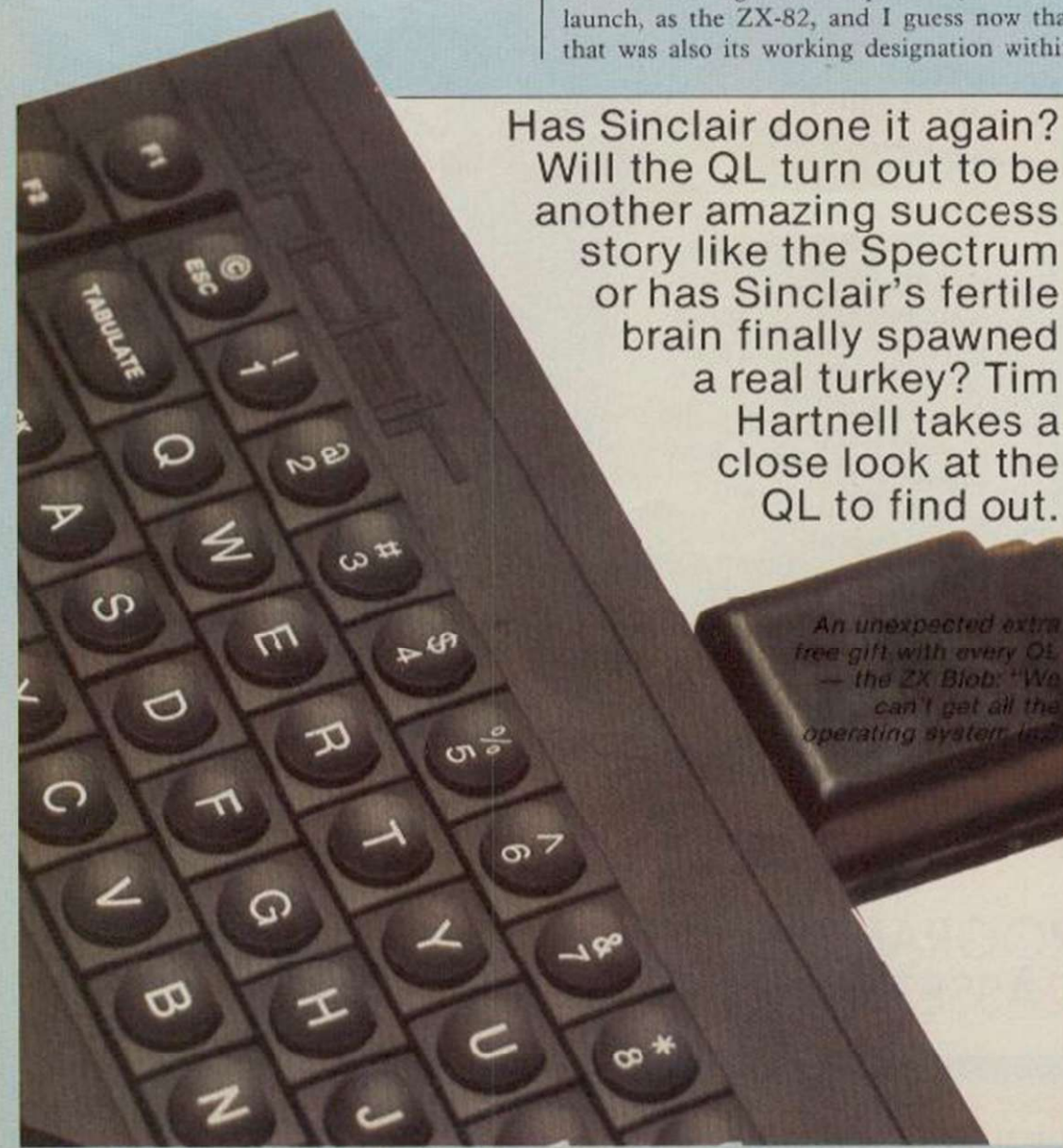
Sinclair Research intimated — without ever saying it straight out — that if the QL without compulsory blob of metal is significantly better than the first edition deliveries, there would be some facility for exchange. No hints as to how this would occur were volunteered.

It seems that the QLs shown at the tumultuous press conference in January did not contain all of the computer. It has been no particular secret within the industry that Psion — the company which developed the four software packs supplied "free" with the QL — did not have access to anything like the final version of QDOS when they were writing the programs. QDOS is the QL Operating System, which looks after such things as task scheduling and resource allocation. And if conversations taking place while I was at Sinclair Research in late April were any indication, it seems that QDOS was far from being finalised even then, only 10 days before the first machines on the greatly delayed delivery schedule were due to go out.

For example, Nigel Searle, managing director of Sinclair Research, told me they were thinking of radically changing the way the Microdrives accessed programs. At present, the QL finds the first block of data which makes up the program, then keeps the tape spinning until it comes to block two, then once it has digested that, looks for block three, and so on. The modification would allow the computer to accept the blocks out of order, thus greatly minimising the time it takes a program to load.

I timed the loading of Quill, the word-processing program provided with the computer, and found it took 70 seconds from the time loading began until the program was ready to use. This may not seem very long if you're used to cassettes, but it is an age compared to discs.

There are now three different editions of the Spectrum around. It seems obvious that



Has Sinclair done it again? Will the QL turn out to be another amazing success story like the Spectrum or has Sinclair's fertile brain finally spawned a real turkey? Tim Hartnell takes a close look at the QL to find out.

An unexpected extra free gift with every QL — the ZX Blob: "We can't get all the operating system in."

Figure 1.	SBYTES	EXP
Inbuilt	SEXEC	INT
Procedures	STOP	LN
ARC	AT	LOG10
ELLIPSE	BLOCK	SIN
LINE	BORDER	SQRT
POINT	CLS	TAN
SCALE	CSIZE	PI
BEEP	CURSOR	CHR\$
INPUT	FLASH	CODE
PAUSE	INK	PEEK
PRINT	OVER	PEEK_W
BAUD	PAN	PEEK_L
CLOSE	PAPER	RND
COPY	RECOL	
COPY_N	SCROLL	Commands
DELETE	STRIP	FOR
DIR	UNDER	REPeat
FORMAT	WINDOW	SElect ON
OPEN	Inbuilt	IF THEN ELSE
OPEN_IN	Functions	DEfine
OPEN_NEW	BEEPING	PROCedure
POKE	INKEY\$	RETURN
POKE_W	KEYROW	DATA
POKE_L	ABS	END FOR
RANDOMISE	ACOS	END IF
CLEAR	ACOT	END REPeat
CONTINUE	ASIN	END DEfine
EXEC	ATAN	END SElect
EXEC_W	COS	EXIT
LBYTES	COT	NEXT
LIST		
LOAD		
LRUN		
MERGE		
MRUN		
NEW		
RETRY		
RUN		
SAVE		



there will be at least two editions of the QL. There may well be more than two of the software packs. I found two spelling errors in the help menu for Quill when I was reviewing the software — although I knew, and it is only fair to point it out, that I was only using a late development version of the software, rather than the final version — and was given the impression that correcting these errors would be incredibly easy. This was, as I've said, just 10 days before the first product was due to leave the warehouse.

Now that we have looked at the fun and games concerning the first QLs which will be released to the market, let's see what sort of a computer it *really* is. Many early "reviews" of the machine were based on the press release, plus two minutes "hands on" at the press conference. I spent many, many hours with a QL trying to assess it completely.

Wet towel test

You know what the QL looks like. The photographs with this review show you the by-now-familiar long, blackish case, with the Microdrives occupying the right-hand six inches, and the rest of the 19-inch length being occupied by the keyboard. The machine is light, but does not appear particularly fragile.

I tried to "wring" the computer — as one would a wet towel — and there was very little give, and no ominous cracking sounds. The horror of losing the 16K RAM pack off the back of the ZX-81 — which meant you treated the machine with great care — does not seem necessary with the QL. Even shaking it fairly violently failed to dislodge the ROM pack, or to disturb the image on the TV screen.

Sinclair keyboards were one of the main sources of complaint on earlier machines. You use the keyboard nearly all the time when interacting with the computer, and any design failure at this point becomes a constant irritation. The QL is about 1½ inches thick, which means when it is lying flat on the table, the keyboard is not particularly easy to use.

However, the machine is supplied with three little plastic square feet which stick on the bottom of the QL and allow it to be tilted forward, to an angle which I found extremely convenient.

The keyboard itself was a surprise, and a very pleasant one. As I spend a lot of my waking hours working with keyboards — generally word-processing on an IBM PC, or writing with an electric typewriter — I am accustomed to keyboards which work *with*, rather than *against*, me. I have become boringly impatient with crummy keyboards,

or with design faults which mean the keyboard cannot keep up with me when I type quickly. The QL is surprisingly satisfactory to use.

The keys are made up of separate keytops, sitting on a membrane keypad below. The membrane construction is not evident from using the keys. Although there is a slight need to press the keytops down rather than just tap them as would be the case with an electric typewriter, only the slightest push is needed to get them to work. The keytops are moulded, so that fast, accurate program entry is easy.

RAM wipeout

The keys auto-repeat after about a third of a second. The space-bar rattles a bit, but this is not particularly important. The Enter key is a large, L-shaped key on the left, there are two Shift keys, and Escape is up near the top right-hand corner of the keyboard. A Reset key is hidden down the side, next to the Microdrives. It is easy to press without looking for it, but is unlikely to be pressed by accident which is just as well, as it performs a total RAM wipeout.

My only criticism of the keyboard lies in the position of the cursor keys. To the left of the

(continued on next page)

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space-bar are the left and right arrows, while the up and down arrow keys are to the right of the bar. I'm sure you will get used to them in that position, but I found their initial use far from intuitive.

No such criticism can be aimed at the position of the five function keys, which form a straight line down the left-hand edge of the keyboard. They are easy to use in this position and are used frequently in the four software packs such as function key 4 being used in Quill to change the typeface.

Sinclair has abandoned the single-touch key-word entry system which, to date, has been a hallmark of his designs. You type the relevant word in full. You can do this in upper, or lower case, and the computer will automatically render the word upper case in the listing. I'll have more to say about this in a moment, but for now, let's turn the machine on, and see what you'll experience when you first plug it in.

There is no on/off switch. The QL comes with an external power supply, slightly taller than that provided with the Spectrum, with the power supply unit sitting in about the middle of this lead. When you turn the power on, the screen fills very briefly with parallel vertical green and red strips, then this is replaced with hi-res rubbish while the QL does a little internal checking. The screen clears to black, and then the following message appears at the bottom of the screen:

F1...monitor

F2...TV

© 1983 Sinclair Research.

The reference to F1 and F2 is printed in red on a white oblong, surrounded by a green border, while the copyright message is in white on a long, red strip. If you press function key 1 to indicate you have a monitor connected to the socket marked RGB, the screen clears to show a rectangular area which fills about two-thirds of the screen.

The left half of this rectangle is white, the right half is red. If you press function key 2 — to tell the QL you have a TV attached to the UHF socket — the screen clears completely to white.

The graphics modes

There are two graphics modes, Mode 256 which is the lowest resolution mode with, as expected, 256 pixels across and Mode 512, which is double the 256 resolution. The QL falls into 256 if you press TV — with a square, purple, flashing cursor — and into 512 if you press for the monitor — with a thin rectangular cursor, flashing red. You can display eight colours — blue, red, magenta, green, cyan, yellow, white and black — on the 256 by 256 screen, while only four are available — black, red, green and white — in the 512 by 256 mode.

Many other colours can be created using the various stipple combinations. There are four stipple patterns — vertical bars, horizontal bars, big foreground dots, small foreground dots — which allow an enormous range of colours to be created. I worked out a program which combined use of the Contrast, Foreground and Stipple commands, which appeared to generate 255 different coloured screens.

Back with our opening frame when you first turn the QL on. If you work with a monitor, or with the QL sending out the monitor hi-res signal, there is a real delight awaiting you when you enter your first program. As you type on the keys, the program you are entering appears in green on the black area below the white half of the coloured rectangle. But each time you press Enter, the program line reappears in red, on the white above you.

There is room for four lines of program below the white area. Once these four are filled, the top one scrolls up under the white area, and vanishes. Similarly, commands like



Enter the real Sinclair keyboard.

Run stay in place in the black area, even after they have been executed.

Now, when you enter the program, it appears line by line in red on the white square above you. If you decide to enter a new line with the same line number as one already in place, the new line automatically takes the place of the original line, in position within the program automatically.

The real magic is to come. Remember, you are in the high-resolution mode, with half the rectangle in white — with the program printed on it in red — and the other half of the rectangle in red. Type in Run, and the program runs on the right-hand side of the screen, appearing — unless other colours are specified — in white on the red background. Your program listing stays in place. So you can see the listing on one side, and the effect of running that listing on the other side, at the same time.

If you are in Mode 256, when the screen clears to a white rectangle, the program listing appears in red on the white as before but with each character stretched twice as wide as in the higher-resolution mode.

However, when you enter Run and press Enter, the program starts running at the top of the white area, overwriting the program listing, and printing in white on little red squares of "paper" as it goes. The screen does not clear, unless you have CLS within your program. If you do include CLS, the screen will clear — unless you specify another Paper colour, just like the Spectrum — to red, and the Ink defaults to white.

A clue to one of the features of SuperBasic is given if you examine the program listing carefully. Certain programming words are spelt in full within the listing, even if you only entered them as three letters. For example, if you include REM in your program, the QL will change it in the listing which appears at the top of the screen as REMark. This happens with many other commands, such as DIMension and DEFine PROCedure.

This leads neatly into a discussion of SuperBasic, the language supplied with the QL. The production models will have, as an extra added since the launch of the computer, what was described to me as turtle graphics, but no clues were given as how to access or implement these graphics.

Turtle graphics aside, the main thrust of SuperBasic is to encourage more structured programming than is usually the case with Basic. Although Goto and Gosub are provided in SuperBasic, the manual claims this is only to give some kind of compatibility with existing Basics. "They are not needed," we are told sternly.

The QL can be used more or less like a Spectrum, programming in Spectrum Basic, and getting roughly similar results. But to work in this way ignores the power of SuperBasic. For example, repetition — controlled by either a For/Next loop, or an endless loop which ends with a Goto back to the beginning, in "standard" Basic — can be controlled in SuperBasic by two "constructs" as follows each construct has to be identified:

```
REPEAT identifier
statements
END REPEAT identifier
FOR identifier = range
or
statements
END FOR identifier
```

These two sections of code are used together with another two words from SuperBasic's vocabulary.

NEXT identifier EXIT identifier

Processing a Next statement will either pass control to the statement following the appropriate For or Repeat statement, or if a For range has been exhausted, to the statement following the next. A table outlining the complete SuperBasic vocabulary is given in figure 1.

Tropical environment

After I'd been using the QL for a couple of hours — and I have no way of knowing how many hours it had been in use before I started on it — the plastic area above the Microdrives became very hot indeed. "A slight increase in warmth above the Microdrives is normal, and should not be cause for alarm," the manual reassures. However, the Microdrives continued to work happily, even in their tropical environment.

You will see that colour generated by the QL is crisp and clear on a monitor, and significantly better on a TV than that produced by Spectrum. Even stippled areas and lines did not show the dot crawl which became a trademark of Spectrum graphics. You have much more control of the screen than is the case with the Spectrum.

The QL allows you to specify the colour of the border, and its width. Windows can be created, with Lisa-like things happening apparently independently in different areas of the screen at the same time.

According to the published specifications, I thought the QL would in certain cases run about twice as fast in Basic than does the Spectrum, but it did not seem significantly quicker to me when doing such things as

(continued on page 69)

TERMINAL SOFTWARE

The illustration depicts a 3D perspective of a space battle. A hand in a green glove is shown pressing a red button on a control panel. The panel features a small screen displaying '05:42:48' and '00000000'. Surrounding the hand are various game-related elements: a large, stylized 'STAR COMMANDO' title in the upper center; several smaller screens showing game status like 'ENERGY', 'SCORE', and 'HIGH'; a target reticle; a 'SPACE MINEFIELD' warning; a 'COSMIC KAMIKAZE' enemy; a 'SAUSONIC RAIDER' enemy; and a 'METEOR STORM' hazard. The background is a dark space with stars and a bright light source.

Win Your Wings

The Galaxy is under attack! You must destroy hostile forces such as Cosmic Kamikazes and Sausonic Raiders, and hazards like Space Minefields and Meteor Storms. Reach the top rank of 'Star Commando' and we'll send you a special 'Star Commando' wings metal badge. A fantastic 3-D perspective fast action game for the Commodore 64. Written by Reg Stevens. £7.95.

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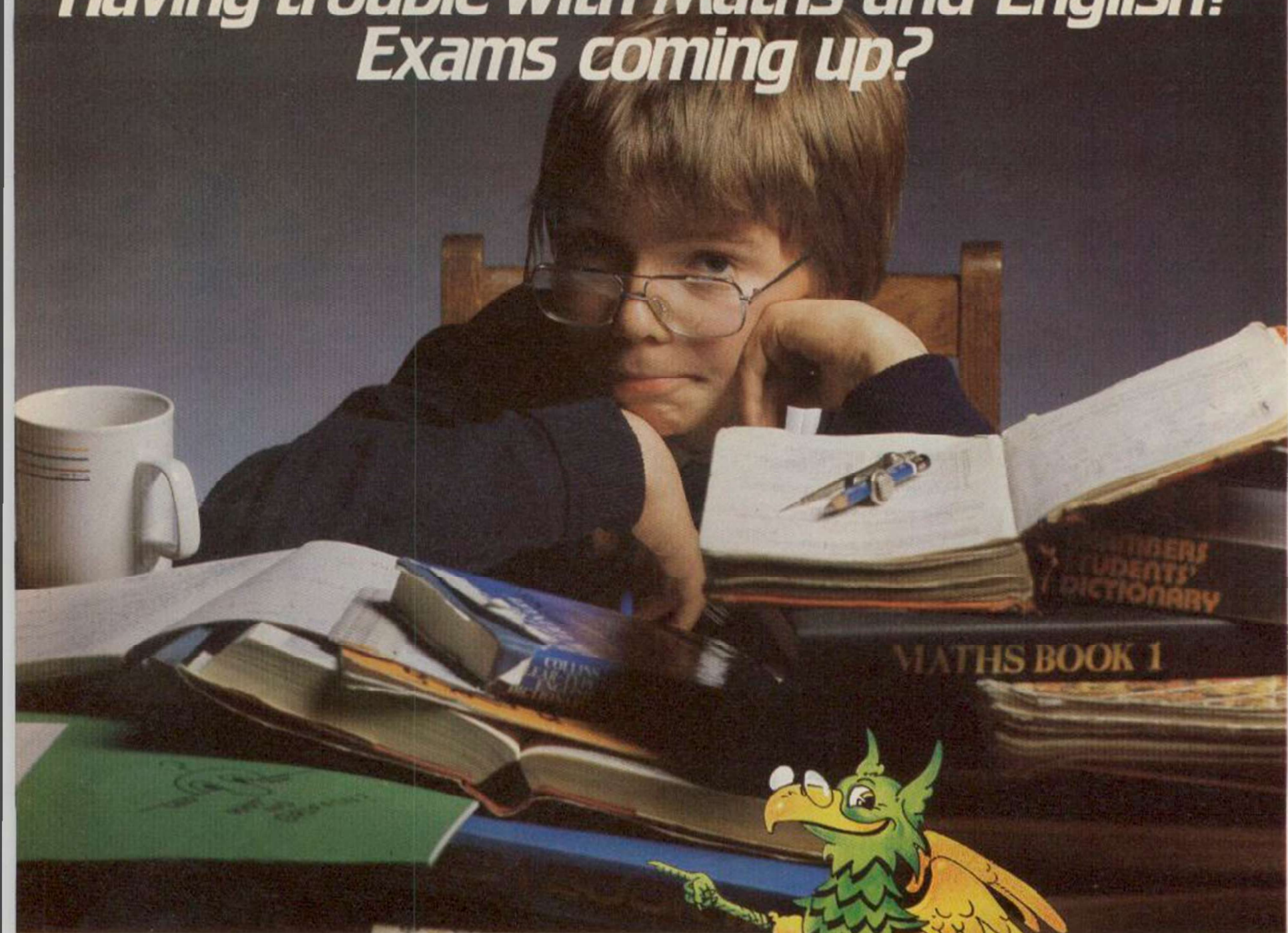
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TERMINAL

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Mathskills II—six important topics are covered here: areas, perimeters, simple equations, percentages, sets and Venn diagrams.

All the programs are bright and colourful, and supplied with full instructions.

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(continued from page 66)

running through loops and printing on the screen. I did not, however, have long enough with the QL to write any moving graphics games in Basic to see how such a program compared with its Spectrum counterpart.

The looseleaf manual is an enormous improvement on the manuals provided in the past with Sinclair products, and shows that Sinclair — probably under prompting from Psion — has at last recognised that it is almost impossible to give people too much information about the product they are buying.

The manual is divided into eight major sections — Beginner's Guide, Keywords, Concepts, QL Quill, QL Abacus, QL Archive, QL Easel and QL Information. The sections on Quill, Abacus, Archive and Easel contain comprehensive instructions for running the software.

QL coercion

Reading the manuals shows many areas where the designers of SuperBasic have been very clever. For example, SuperBasic embodies an action called "coercion". If the QL is expecting a string, and you give it a number, it will automatically turn it into a string. Similarly, if you try to add two numbers, and one of them is in the form of a string, it will convert the string to its numerical equivalent — in effect, Val the string — rather than crash with an error message.

This means the QL needs to know when you are dealing with strings, and when you mean numbers, so it uses the plus sign for adding numbers and the ampersand for adding strings. The following are valid in SuperBasic.

LET A = "3" + 4 (sets A equal to 7)

LET A\$ = 6 & "32" (sets A\$ to "632")

The use of Let, as in nearly every Basic in the

world except the first three Sinclair Basics, is optional.

There are a number of other ways the designers of SuperBasic have worked to produce a better language for you. If you ask the QL to print a variable which has not been assigned, it does not respond by crashing or by assigning the value 0 — or the empty string — to this unknown variable. Instead, the QL prints an asterisk as a sign that you have requested an undefined variable. If you fail to specify a Next command, the computer will continue to process quite happily, but will ignore the For which is not followed by a Next.

Those who decried the faint Beep on the Spectrum will be pleased to hear the QL gives out a very healthy tone, much louder than that produced by the BBC Micro. The command Scroll is followed by two numbers. The scrolling can be positive or negative, and single display line — that is, pixel — scrolling is possible.

The QL contains a real-time clock — accessed as Dates — which is set to a random time and date on switch on. Despite the claims of the manual that Dates could be manipulated like any other string in Sinclair Basic the only effect of a slice was to change the time set on the clock, rather than to extract a section of it.

The QL comes with four software packs supplied on Microdrive, a word-processor — Quill; a spread-sheet calculator — Abacus; an intelligent database — Archive and one to produce business graphics such as bar charts — Easel.

I suspect that for many non-business owners

of the QL, Quill will be the most popular program of the four. While many of us have little need to draw bar charts of such things as our steadily-increasing personal wealth, all of us tend to write letters, school essays or reports.

When you start with Quill, you have a red frame on the screen, on which you are typing in green. The start of each paragraph is automatically indented, without you doing anything. Above the red frame are printed many operation instructions, such as the one telling you to press function key 4 to change the typeface.

Rapid response

You do not need to worry about a word being split at the end of a line, as the QL automatically starts a new line when needed, and spaces out the words on the line which you've just completed so that the right- and left-hand margins both form straight lines. This happens without you needing to know anything. The system responds rapidly to typing. There is no appreciable delay when typing in on "clean paper".

If, however, you wish to overwrite, the system slows down to an annoying extent. Despite this, the program really does live up to its claim that it can be used without reading the manual. Function key 1 is permanently assigned to help, so pressing it leads you into a series of sections designed to get you out of trouble. Once you exit the help mode, you will find yourself exactly where you were before you called for help, so you can continue from that point.

There are five kinds of typeface available with this program — normal; bold; high which produces supercripts; low — subscripts, and underline. They can be mixed, so "bold, underlined, high script" is a valid mixture.

CONCLUSIONS

- You're going to like the QL. As with all Sinclair products, it may display quirks and annoyances which are not immediately obvious, and the slow access times of the Microdrives may annoy you, but overall it is a fascinating package.
- The colours are bright and clear and the multiple-colour, multiple-width border and windows will get a lot of exposure in coming games packages.
- Despite all its flashiness, the QL is an unproven machine. The Microdrives are unproven mass storage devices. I suggest it would be a brave business which would entrust essential data to Microdrives.
- It is hard to imagine it being adopted as a "business machine" by any but the smallest of companies. It makes a great home machine, and there is no doubt that many of the 750,000 Spectrum owners will upgrade.
- There is a slightly tacky feel to



the machine, and I would hesitate to recommend it to someone who could be buying a BBC Micro — admittedly without mass storage, and without software packs — for the same price.

- The QL is certain to be a commercial success. Some brilliant software will be written. Lots of people will have lots of fun with the machine ... and yet I

sense that the time for foisting unproven products on the marketplace has gone.

- The QL may have been announced six months too soon to try and get the BBC to turn their favoured glance away from Acorn. The QL has, predictably, stretched the definition of "28 days" beyond the recognition of mortal men.



REVIEW

AMSTRAD

Is Amstrad's CPC-464 a treasure chest or a Pandora's Box? Simon Beesley plugs in and goes.

AMSTRAD MADE ITS mark in the hi-fi market by selling high-specification stereos, which could simply plug in and go, at a low price. Adapting the same formula to the home computer market the company is now offering a complete system for £229.

The Amstrad CPC-464 comes with a built-in cassette recorder and a monochrome monitor. With a colour monitor it will cost £329. These are recommended retail prices. By the time the machine appears in chains like Boots, Rumbelows and Dixons it will probably be selling at around £200 and £300. A disc package will follow in September comprising a three inch disc drive, disc controller, CP/M and Logo, all for £199.

The Amstrad computer is built around a Z-80A processor which runs at 4MHz. On board it carries 64K RAM and 32K ROM. By plugging an expansion board into the disc interface at the back you will be able to add alternative ROM or RAM cartridges, 16K at a time.

Along with the disc interface there is also a stereo jack for sound output, a joystick port and a parallel printer interface. At the side of the unit there is a power switch and volume control for the internal speaker.

The keyboard has 74 keys with a good springy feel to them. It includes a numeric keypad which also doubles up to provide function keys each capable of producing a string of 32 characters.

Amstrad is making the fact that the machine comes as an integrated system a prominent selling point. My own view is that the virtues of this feature have been overstated. After all most users do not find the business of connecting up a cassette recorder and a TV especially cumbersome. And probably most buyers will opt for the cheaper system using a modulator for colour display on a TV while retaining the monochrome monitor for 80-column business software.

Amstrad's designers have taken pains to ensure that the display is rock steady, and even on a colour TV it should be superior to that of the average home micro. The character typeface, incidentally, is an exceptionally clear one which uses two dots to form each vertical stroke.

What does make the built-in cassette recorder a welcome feature is that it should rule out the sort of loading and saving problems that bedevil almost every other micro. As an extra aid to reliable storage there is a choice of two data transmission rates, 1,000 baud and 2,000 baud.

Saving from Basic is also well catered for. As well as saving a program in its normal

tokenised form you can also save it as an ASCII file or as a protected file. Once protected it can only be loaded with the Run command which should guarantee security. In addition there is a command to save any block of memory, equivalent to the Spectrum's Save Code or the BBC's *Save.

This spread of commands devoted just to tape storage is indicative of Locomotive Basic's scope. By allowing 16K each for the Basic interpreter and operating system as opposed to the more usual 8K the designers were able to make the ROM software both highly extensive and fast. As far as speed goes it is only a shade slower than the BBC micro.

Unlike the BBC ROMs Amstrad's 32K ROM does not limit the amount of RAM available. The screen memory occupies 16K of the 64K RAM and the operating system takes a further 5K for work space, leaving the user with just over 43K RAM.

People who are used to the idea that 8-bit micro have only 64K to share between ROM and RAM may find this puzzling. The way it works is by switching between ROM and RAM. When, for example, the display controller reads the screen memory in RAM the Z-80 processor goes into a wait state. It then switches to the Basic in ROM which occupies the same top 16K as the screen.

Similarly, the ROM-based operating system and Basic program area occupy the same space at the bottom of memory. The processor copes with this by alternatively turning ROM and RAM on and off.

Locomotive's Basic is a version of Micro-soft, greatly enhanced by graphics and sound commands, and a number of other unique features. Thus Locate to position the text cursor and Print Using, which formats print output, are familiar enough; but After and Every are special to the Amstrad.

They give the Basic programmer a chance to use interrupt routines, a feature normally only available from machine code.

The Every command interrupts a program



at regular intervals and directs it to a subroutine.

EVERY 10 GOSUB 200

calls the subroutine at line 200 every 10/50s of a second. The After command does the same thing but only once.

Speed Key and Speed Ink are likewise unusual. The first sets the key repeat period while the second determines the rate at which colours flash. Key Def is another newcomer which redefines the keys so that, for example, you could convert the N key to print the question mark character.

Along with such novelties there is a particularly full set of programming aid commands and debugging features. These include Renumber, Delete, Trace and some extra error-trapping instructions, On Break Gosub and On Break Stop.

To force a break you need to press the escape key twice; pressing it once simply halts the program until you hit the space-bar — another useful feature not commonly found on home micros.

To edit a program you have a choice of using either the standard Microsoft line editor with its Edit command or the copy cursor. The latter is much easier and lets you move to any line and then copy part or all of it down to the bottom of the screen.

On the graphics front the Amstrad is particularly well favoured. There are three modes. Text and graphics can operate together in each of them. Mode 1 is standard and gives 40 columns by 25 rows of text or 320 by 200 pixels with a choice of four colours.

In Mode 2 the resolution drops to 20 by 25 and 160 by 200 but the choice of colours is increased to 16.

Mode 0 provides 80 columns by 25 and a
(continued on next page)





(continued from previous page)

pixel resolution of 640 by 200, in two colours.

It will be seen that the screen modes are similar to the BBC's without the BBC's text-only modes. The similarity also extends to the way the Amstrad allows you to choose on-screen colours from a wide colour palette.

In all there are 27 colours ranging from blue, mauve, yellow and green to lime, pink, pastel green and bright yellow. The idea is that in each mode there are a limited number of colour pens and these can be assigned any of the colours in the palette.

Pen is the command which selects the current colour. Thus in Mode 2

PEN 3,10

activates Pen 3 and assigns to it colour 10 which is cyan. Any future text printed will be in cyan. As a further elaboration you can now use the Ink command to assign a different colour from the palette to colour 10.

INK 10,12

causes colour 10 now to be associated with yellow and means that all text or graphics on screen which is in cyan will be instantly changed to yellow. You can also use Ink to create any combination of flashing colours.

Equivalent to the BBC's VDU 19 but easier to use, the Ink command is a powerful feature. As BBC owners have discovered palette switching allows you to produce fast animated effects without leaving Basic.

For pixel plotting there are absolute and relative commands to plot points, draw lines and move the cursor — Plot and PlotR, Draw and DrawR, Move and MoveR. Test and TestR report the ink colour of a given pixel, while XPOS and YPOS return the position of the graphics cursor.

Again, as on the BBC, there is also a facility for setting the mode in which a pixel is plotted. By sending a control character before the Ink command you can cause the new

CONCLUSIONS

- A 64K computer complete with cassette recorder and monitor, all for £200, must be considered remarkable value.
- In addition CPC-464 boasts graphics which are superior to those on any other micro in this price range; while its sound facility is matched only by the BBC Micro and the CBM-64.
- Making use of these features is facilitated by an extensive and well thought out Basic.
- The machine seems assured of success and in consequence should receive strong software support. ■

colour to be logically Anded, Ored or Exclusive Ored with the old colour. This is highly useful for animation and plotting shapes without obliterating the background, making all sorts of sprite-like effects possible.

For text there is a corresponding option which allows you print in transparent mode. Here the characters are superimposed on the background rather than printed over it.

These commands alone make the Amstrad's graphics superior to those on, say, the Spectrum or the Oric. Unlike these machines you can also create genuine multi-coloured characters since each pixel can be given a separate colour. Add to these features the facility for creating screen windows and you have a micro whose graphics are second only to the BBC's.

Up to eight text windows can be defined. Each is linked to a text stream which makes it easy to print to a specific window. To give an example, WINDOW #2,0,10,10,0

would set up a square window in the bottom left corner;

PRINT #2

directs text to that window alone. In addition the Origin command sets up a single graphics window as well as fixing the X and Y origins.

The final bonus in the graphics department is the ease with which user-defined characters can be created. Above the normal ASCII

codes the character set is filled with pre-defined graphics characters. When the machine is turned on, the dot patterns for the top 16 characters are read into RAM.

These can be redefined by the command Symbol followed by the character code and a list of eight numbers making up the new pattern. In addition you can redefine the rest of the set from codes 32 onwards. You simply enter the Symbol After instruction, which reserves memory for the number of definitions you require.

Sound on the Amstrad is equally impressive. Once again the designers seem to have taken a leaf out of the BBC's book. The AY-3-8912 sound chip produces three voices which can either be output in mono through the internal speaker or sent in stereo to external speaker.

The Sound command can be used to produce a simple sound — either a musical note or white noise — where only the channel, tone, duration and volume are specified. Or it can be linked up with two Envelope commands to create much more complex sounds.

Env, the volume envelope command, allows you to divide a note up into a number of sections. In each you can specify how the volume is to rise or fall.

Ent, the tone envelope command, does the same thing for a note's tone. Between them you can define up to 15 envelopes, synthesising a variety of musical instruments. By setting parameters in the Sound and Release commands you can also arrange that notes on different channels are synchronised.

On top of the features described so far it is likely that the Amstrad has a good deal of untapped potential, particularly for the machine-code programmer. Two such undocumented possibilities mentioned by Roland Perry, one of the designers, are hardware induced sideways scrolling and setting up alternative screen memories.

Locomotive has designed the operating system to be highly accessible to the user. Many of its routines are called via jumpblocks in RAM. This means that they can easily be altered or adapted.

All in all the Amstrad's future looks rosy. Superior graphics and sound, an excellent Basic coupled with a flexible operating system would seem to be winning ingredients. Of course for most buyers a computer is only as good as the software that is available for it. But for a new machine the Amstrad looks likely to be well supported.

Already a number of best-selling titles have been converted, Harrier Attack and Bugaboo among them. The company's target sales figure of 200,000 machines by the end of the year stands a good chance of being realised.



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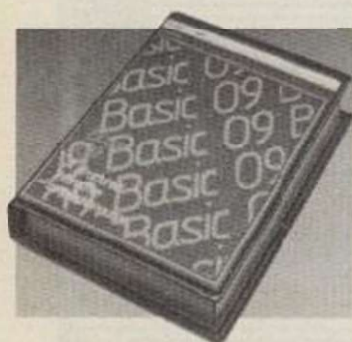
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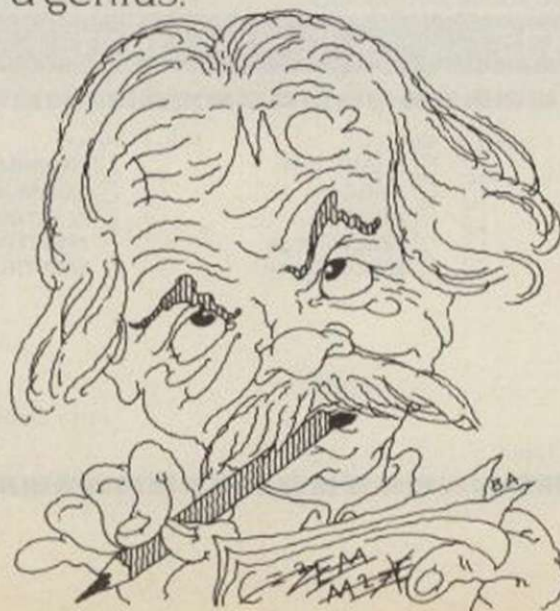
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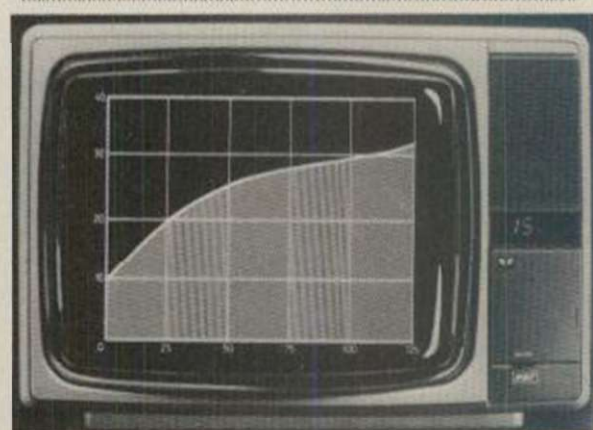


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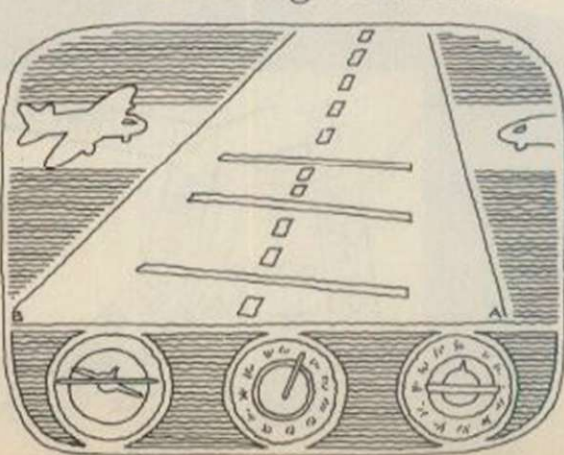
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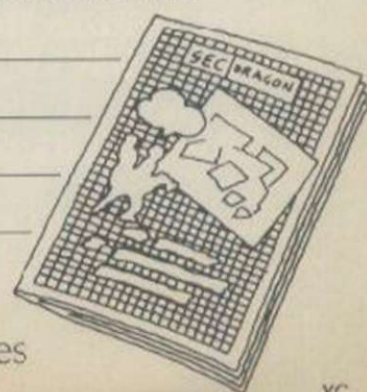
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AMSTRAD Competition

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RULES

- ☐ The winners of the competition will be the people who number the games features correctly and enter the most original name for a computer game in the view of the editor.
- ☐ The name of the winners will be printed in the August issue of *Your Computer*.
- ☐ All entries must arrive at the *Your Computer* offices by the last working day in June 1984.
- ☐ Each person may enter the competition only once.
- ☐ Entries to the competition cannot be acknowledged.
- ☐ No employees of Business Press International or their relatives may enter the competition.
- ☐ The decision of the editor is final.
- ☐ No correspondence on the result of the competition will be entered into.
- ☐ Business Press International assumes no responsibility or liability for any complaints arising from this competition.

CPC 464

AMSTRAD Competition

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- ☐ High resolution graphics
- ☐ Different screens
- ☐ Sound effects
- ☐ Quick reactions
- ☐ Problem solving
- ☐ User definable controls
- ☐ Realism

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Title.....

Name.....

Address.....

SURVEY

CBM-64 SOFTWARE

Paul Bond destroys the nasties and enjoys the music.



SIGNIFICANTLY FOR a computer with such a large memory — 64K of onboard RAM — one of the more original games programs for the Commodore machine features a sidelong slice of the cerebellum as its screen display. Zyco is an alien enslaving the human race. The goal of Ace's Mind Control maze game is to steer through the cortical convolutions until you reach Zyco's nerve centre.

You have to dodge the white blood corpuscles and avoid bumping into cell walls otherwise you will revert to human size and die. It's a scenario straight out of that science-fiction phantasmagoria *The Fantastic Voyage* which should be remembered if only for the fact that it succeeded in cramming Raquel Welch into a mini-sub.

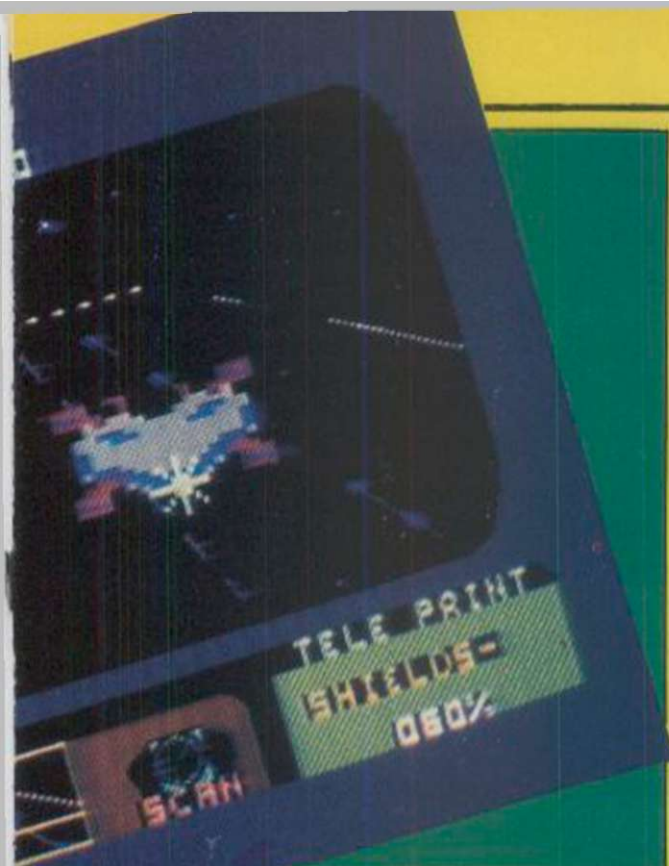
The game is a little like that reflex-testing game, sometimes encountered at small country fetes where you have to move a wire along a complex wire loop without touching it and making the bulb light up. Taxing but potentially tedious. Anyway, if you deminaturised accidentally wouldn't you kill Zyco?

Bach's Toccata and Fugue in D minor (Schmieder number BWV 565). Can you dig it? CBM-64 programmers certainly can as it appears in two of the games programs I looked at for this issue. Perhaps that old SID chip has sympathetic vibrations with the classics.

Paramount's Megawarz is good solid shoot 'em-up space trip stuff. Waves of aliens attack in threes as you pump endless shells into

them. Eventually they blow up. Then you have to rescue astronauts floating around in space. But you must be snappy or else they mutate into weird flapping mutants rather like commuters who have just been told that the 8.30 train has been cancelled.

On the third screen there is a terrible melee of aliens and astronauts and the potential for carnage would be unbelievable, except that you can't kill your own spacemen. When you warp from screen to screen you also get a quick blast of Richard Strauss's *Also Sprach Zarathustra*, which was such a big hit for the lad when it was used as theme music for Kubrick's *2001: A Space Odyssey*. If you score more than 50,000 you join the megamortals. The screen graphics are stolid rather



Above: *Triad* from Livewire.
Left: *Mind Control* from ACE.
Below right: *Megawarz* from Paramount.

than exciting as is, ultimately, the game itself. But I loved the sound.

Bach's Toccata etcetera makes a comeback in Livewire's *Triad*. No relation to the Chinese secret society dedicated to the overthrow of the Ching dynasty, it nevertheless shows promise. What might be described by more fanciful software companies as a 3D game confronts you with wave after wave of smiling triads leering all the way up to the external reception apron of your starship as you zap away at them. Then you clear a path through a meteor storm. You get promoted. And so it goes — but once again the music is excellent.

Troopa Truck from Rabbit Software is a simple but colourful game, well-implemented and quite addictive. You drive a six-wheeled lunar buggy over rocky terrain backed by a diorama-style 3D landscape.

Defender in underpants

There are large black boulders to be disintegrated, red landmines and chasms to hop over and also unfriendly flying objects which shoot at you and generally do their best to discourage Bank Holiday traffic. The buggy makes a good chugging sound, there is incessant music but Bach is not responsible. You can naturally shoot down said UFOs.

But if driving trucks is not your bag, you'll believe a man can fly with Ace's *Krypton*. In this you are cast as a superhero — no names, no pack-drill — and you have to destroy the enemy superbeings. You also have to try and save your girlfriend — who is ridiculously small at this resolution — from falling off a skyscraper. It's *Defender* in red underpants — and watch out for the mobile ground control pod which shoots lumps of kryptonite at you. An enjoyable enough game but not really very original apart from the fancy-dress.

Also not very original in concept is the Q-bertesque *Slinky* from US Gold. But this program, which I reviewed on disc, is a very sophisticated and colourful implementation indeed making full use of the 64's sound and graphics capacities. You steer a slinky spring

around cubes arranged in a pyramid. As the spring touches the faces of the cubes they change colour. When you have changed all the cubes you get a blast of classical music — no, not Bach but Tchaikovsky! The 1812 Overture without the cannons — a great opportunity missed here, I feel. An interesting contrast with the menacing HM riff which introduces the five threats to Slinky's progress.

More exciting, and likewise available on disc from US Gold is *Aztec Challenge*. This has a rather lurid cover showing a doe-eyed Indian maiden being pursued by a chap in Quetzalcoat look-alike gear, but as far as I could get with the game it all seemed to be good clean fun, if running the gauntlet of spears, rock-strewn stairways and booby-trapped hallways is your idea of a healthy pastime, that is.

Music soundtrack for this game is once again excellent. The first screen display presents you with a view of an Aztec runner from the back running between two lines of warriors stretching away into the distance, ending at the base of a pyramid. The primitive pulse of native drums accompanies you as you run the gauntlet of deadly spears. Press joystick forwards to duck, pull back to jump. The spears whizz over at head-height or leg-level. You have five lives, but if you get caught once you usually get caught three or four times.

Anyway, you get sent all the way back to the beginning of the twin file of Indians. This is maddening. Eventually, you get to the foot of the temple steps. Far from encouraging a congregation the local preachers chuck cube-shaped rocks down the steps at those with temerity enough to mount them. You dodge the blocks. Once inside, trap-doors open up beneath your feet, spears fall from the roof and vertical saws spring up from the floor. Heard of high tech? Well, this is Aztec. Full marks all round for a program that points the way for CBM-64 programming. It even has piranhas.

Forbidden Forest, also on disc from US Gold, is certainly very promising indeed. You, as an archer, have wandered into a dangerous area of the forest. Coming under attack from the residents which include giant

spiders, bumblebees, and bouncing frogs you have to put an arrow in your bow — press fire button once — and fire it — press fire button again.

Even this is not very easy when a 10-ton tarantula is about to chew you up. Which they do — you struggle helplessly, and vast amounts of claret are spilled all over the forest floor. Not a game for those with a nervous disposition, especially if they are arachnophones. The graphics, if somewhat grisly, are certainly gripping.

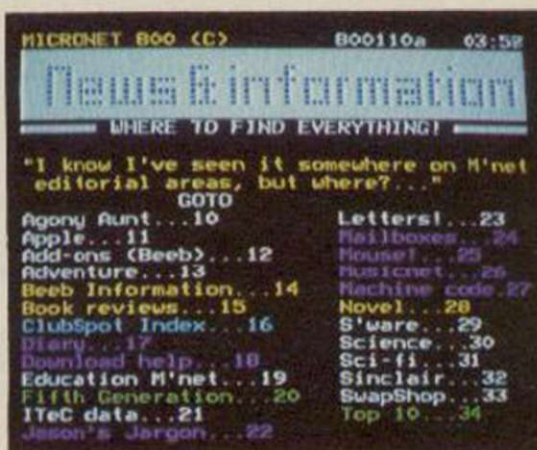
Bugs in bugs game

Entomology rules the day in Mogul Software's *Fire Ant* as well. As the last free ant you must rescue the queen ant from her scorpion prison. Oviparous scorpions lay eggs all over the maze; gobble these, grab the golden keys and move from screen to screen. There are still a few bugs of the other sort in this program, even in the production version: for example, when you press Y to get instructions, you don't get any instructions.

Another criticism is documentation: there are lots of things to pick up which give you different sorts of immunity and ways to get through barriers to achieve the eighth screen. If accessing the instructions on the computer is impossible on some of the copies, as would seem to be the case, Mogul should have explained more about the game on the cassette inlay. Nevertheless, a challenging and absorbing game.

Program	Company	Price
Mind Control	ACE	£6.99
Megawarz	Paramount	£7.50
Triad	Livewire	£8.95
Troopa Truck	Rabbit	£5.99
Krypton	ACE	£6.99
Slinky	US Gold	£9.99
		(cassette)
		£12.99
		(disc)
Aztec Challenge	US Gold	£9.99
		(cassette)
		£12.99
		(disc)
Forbidden Forest	US Gold	£9.99
		(cassette)
		£12.99
		(disc)
Fire Ant	Mogul	£7.95

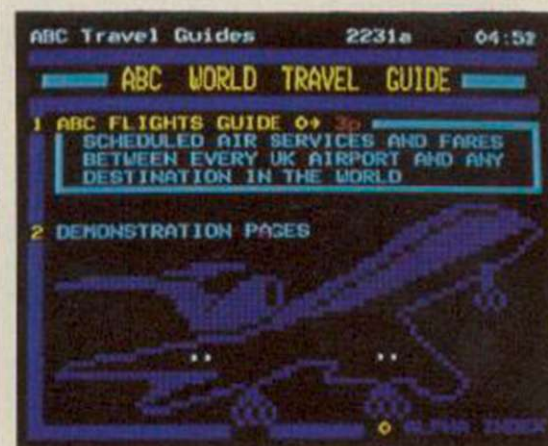




PLUG IN TO REALITY



Inside your tame home micro a monster is struggling to break out and take over the world. A £50 modem will let you plug into Prestel, dip into databases and still do some tele-shopping and stave off World War III before tea time. Richard Lambley delves deep into this unleashed potential.

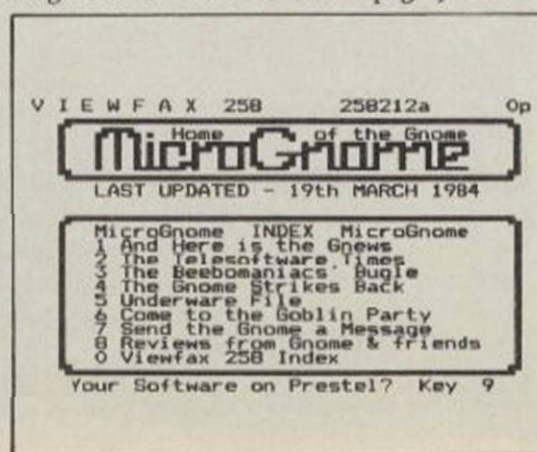


WITHOUT A DOUBT, a modem is one of the most worthwhile additions your computer can have. It can cost far less than a disc drive or a printer and yet it can transform your system. With a modem, you can exchange software over the telephone, conduct your financial affairs, bombard your friends with electronic mail and go adventuring in multi-megabyte databases.

All you need to use a modem is a telephone plus a computer with an RS-232 serial port. If yours doesn't have one of these, or something like it, don't lose heart — it's quite possible to get one fitted.

Having seen to that, what is there to dial up? To most micro owners, modems mean, if anything, Micronet 800. Micronet is a section of British Telecom's Prestel service, offering its

subscribers a sort of computing magazine by telephone. There are thousands of pages, covering all the subjects you would find in a printed magazine. It includes news pages, reviews,



technical advice, software, some of it free, club bulletins, mail and advertising.

Certain sections of Prestel are, like Micronet itself, the preserve of closed user groups and so are barred to outsiders. But Prestel's other microcomputing database, Viewfax 258, is available to all, with more news, gossip, tele-shopping and telesoftware.

From most parts of the country, Prestel can be accessed at local telephone call rates. Outside business hours there is no charge for using the computer. So it's possible to make extensive use of your modem without running up an enormous phone bill.

But beyond Prestel is a growing network of computer bulletin-board systems, run by private enthusiasts rather than businessmen. These fascinating systems are in some ways like

MODEM



POWER

WELCOME TO THE U.K. ATARI OWNERS CLUB PAGE ON MAPTEL.
CLUB NEWS.
ISSUE 4 OF THE NEWSLETTER IS NOW OUT AND CONTAINS MANY INTERESTING TIPS AND HINTS, PROGRAM LISTS SUCH AS PECKMAN, STUNT RIDER, HEX, AND COMPUTER ASSISTED DESIGN. IT ALSO HAS A REVIEW ON JOYSTICKS AND ARTICLES ON DISPLAY LISTS AND ADDING TEXT TO GRAPHICS 8. PLUS OUR USUAL FEATURES INCLUDING THE SOFTWARE LIBRARY EXCHANGE AND CONTACT SECTION.
ENTER CR < TO CONTINUE -

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Owners of BBC B microcomputers have a choice of modems.
Acoustic Modem: A 1200/75 baud coupler together with ROM based software still remains good value at £74.95
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Modem 2000: plus ROM software £108.65 A direct connect modem with 1200/75 baud rate, plus 1200/1200 user to user communication auto switchable.
All the above prices includes VAT & P&P
GOTO 1 Other Micros 9 Main Menu

MICRONET 800 (C)
Telesoft Super
WHERE GOOD
11 BBC
12 SPECTRUM
13 APPLE
14 PET
15 TRS 80
4 Software f
5 Telesoftwa
9 Micronet M
7 From the P

(continued from previous page)

standards.
The picture has now begun to change, with the introduction of dual-mode systems capable of switching automatically to the standard adopted by the caller. But the introduction of a modem chip capable of handling all common signalling standards is bringing to the shops a crop of universal modems suitable for whatever applications the hobbyist is likely to find. The complex filtering needed to achieve reliable generation and detection of the tones is all dealt with on the chip, so the new modems are relatively simple in construction and competitive in price.

Here we meet the issue of acoustically-coupled modems versus the direct-coupled type. Acoustic modems have been popular with home users because they're portable, simple to use and involve no electrical connection with the telephone line. Having dialled your call, you just wait for the answering tone and press the telephone handset into the rubber cups on the modem. Then they squawk to each other. Unfortunately, noise from the room can be picked up and mixed in with the data, so errors may occur. So you may prefer to use a direct-connect modem, which plugs straight in to your telephone socket, eliminating this source of interference.

Many direct-connect modems are now available for the home user, although not all of them are smiled upon by the telephone authorities. Equipment to be connected to telephone lines has to be submitted by the manufacturer for approval; and obtaining a certificate can be a slow and expensive business. Some modems on the market do not have this approval, even though they may be perfectly sound technically. Potential users should be warned that, despite recent relaxation of many of the restrictions surrounding our telephone system, it's now actually an offence to connect unauthorised equipment to it.

Although British Telecom can withdraw the service from malefactors it finds, or invoke legal proceedings, it has no easy way of catching them. And so, where no harm is being done, it may be content merely to sit back and collect the extra revenue.

To use a modem, you need software. A bare-bones program would first set up your serial port to operate at the appropriate speed. Then it would route characters typed at your keyboard to the serial port and would send incoming data from the port to your screen.

A practical program needs to be a little more complicated. For one thing, it has to cope with

MAPTEL 06-APR-84 TIME 23:12
PAGE..0
(MAPTEL B. RJBK/24/A)
WELCOME TO THE MAPLIN MAPTEL COMPUTER
MAIN MENU
MAPTEL INFORMATION... (1)
CASHTEL INFORMATION... (2)
MAPLIN NEWS..... (3)
ELECTRONICS MAGAZINE.. (4)
COMPUTER NEWS..... (5)
USER GROUP NEWS..... (6)
HELP..... (7)
CASHTEL B (8)
ENTER OPTION (M=MENU,H=HELP,E=END.)6

possible variations in the make-up of the data word.

Before each byte, a start-bite is sent to indicate that data is to follow. Then afterwards, there may be either one or two stop-bits. In the middle, the length of the byte itself may vary: Prestel, for example, gets by with only seven bits instead of eight. There may also be a parity bit as an insurance against errors in transmission, and it can be either odd or even. So you can see that many different permutations are possible.

To show what you are typing, your own input must be echoed back to you. If the computer at the other end does not give an echo, you will want to provide your own. Another option you may want incorporated in your software is reprogramming of some of the characters sent by your keyboard. For example, your delete key may produce strange results on some systems and it helps if you can alter its effect to suit the other computer.

It is often desirable to be able to halt the flow of data from the remote computer while you perform some background task — saving something to disc, perhaps, or answering the doorbell. For this you can use the so-called Xoff and Xon signals, Ctrl-S and Ctrl-Q.

If you want to download program or text

files, you will need a buffer in memory into which each block of data can be loaded as it arrives, ready for saving when the file is complete. Some software packages offer elaborate techniques for ensuring accurate file transfer. A widely-used standard is the Xmodem or Christensen protocol, by which the receiving computer calls for a repeat of any block of data found to be corrupt.

Source of modems

For Prestel users, a ready source of modems and terminal software is Micronet 800, which can provide 'communications packs' to suit a range of popular micros. Software for 300 baud modems is available from a variety of sources. Maplin Electronic Supplies, who offer a modem construction kit at less than £45, can also supply serial interfaces and software for the Dragon, Oric, Vic-20, Commodore-64, ZX-81 and Spectrum.

Best served, perhaps, are the long-established TRS-80 and the BBC Micro. Users of the BBC Micro have a choice of two excellent ROM packages: Communicator 16K from Computer Concepts and Commstar 8K, from Pace Software Supplies. The latest version of Commstar includes a Prestel mode which allows telesoftware downloading.

Useful addresses

- Buzzbox 300 baud:** Scicon, Brick Close, Kiln Farm, Milton Keynes MK11 3EJ, 0908-567567.
- Minor Miracles:** Miracle Technology, PO Box 48, Ipswich IP4 2AB, 0473-50304.
- Grapevine, Commstar ROM:** Pace Disc Systems, 92 New Cross Street, Bradford BD5 8BS, 0274-729306.
- Micronet:** Prism Microproducts, 18/29 Mora Street, London EC1V 8BT, 0274-729306.
- Tandata:** Tandata Marketing, Albert Road North, Malvern, Worcestershire WR14

- 2TL, 337617; Prestel page 799.
- Maplin 300 baud kit, interfaces and software:** Maplin Electronic Supplies, P.O. Box 3, Rayleigh, Essex SS6 8LR, 0702-554155.
- Software for the TRS-80:** Molimerx, 1 Buckhurst Road, Town Hall Square, Bexhill-on-Sea, East Sussex, 0424-220391.
- Communicator ROM:** Computer Concepts, 16 Wayside, Chipperfield, Hertfordshire WD4 9JJ, 09277-69727.
- Micronet 800:** Scriptor Court, 155 Farringdon Road, London EC1R 3AD, 01-278 3143.

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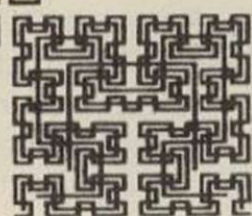
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TUNE IN TO BBC

John Dawson looks at Commstar — a communications program for the BBC.

THE COMMSTAR PACKAGES from Pace Software Supplies is the third link in a communications chain between two computers. When you have a modem connected to a telephone line, and a micro-computer connected to the modem, you only need a program to control the computer to put you in business.

Commstar is a communications program which will allow you to use your BBC Micro as either a dumb terminal to a remote computer, or as an intelligent machine, able to send and receive files with full error checks to ensure accuracy.

Computers using the CP/M operating system can use the Peripheral Interface Program (PIP) to transfer a file of information out to the paper-tape punch or in from the paper-tape reader. These obsolete terms

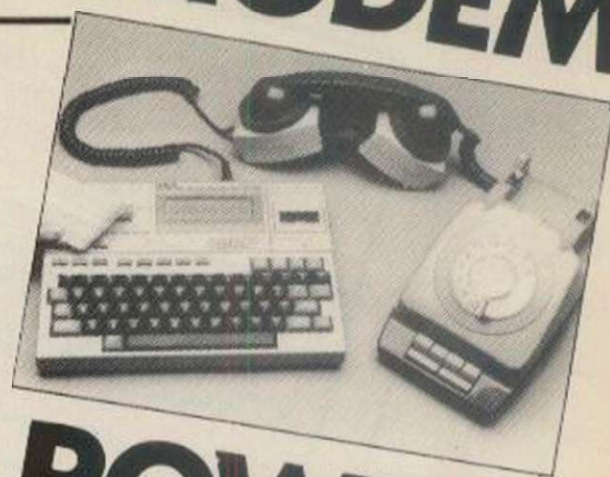
conceal the fact that a modem can act as both a reader and punch.

But that is terribly clumsy, allows no conversation with the remote computer and has no error-checking capacity. It is a little like standing in a dark room, shouting into the silence and hoping that someone will hear you.

Proper CP/M communications programs are not particularly new and there are a number of more or less unfriendly packages that have been available for some time. ASCOM, BSTAMS and BSTMS are all designed to link two computers for the purpose of transferring files. Most of them will only handle ASCII text files because the ASCII control codes are used, as they should be, for various control purposes in the course of data transmission.

Commstar changes all that, providing instead a friendly, orderly and effective means of transferring information from one computer to another. The program is easy to use and the following functions are available:

MODEM



POWER

- 1 Initialise the BBC Micro RS-423 interface.
- 2 Chat to a remote computer.
- 3 Store incoming data in a buffer area of memory.
- 4 Save the buffer on tape or disc.
- 5 Load the buffer from tape or disc.
- 6 Output the buffer to the remote computer.
- 7 View the buffer on screen and copy it to a printer with a Centronics interface.
- 8 Transfer files from one computer to another using the Xmodem standard.

In addition to these main functions, Commstar has the following facilities:

- ☐ Elapsed time clock
- ☐ 40-or 80-column display
- ☐ XOn/XOff protocol
- ☐ Screen display can be switched on or off
- ☐ Auto line feed can be switched on or off
- ☐ MOS commands can be executed from within Commstar

(continued on page 91)

PACE Commstar (C) A.Hood 1983 00:36

 Copy to buffer	<L> Load Buffer
<R> Reset buffer	<S> Save buffer
<O> Output buffer	<V> View buffer
<W> Wipe buffer	
<A> Auto Line Feed	<E> Echo switch
<I> Initialise 423	<M> MOS command
<T> Text mode 7/3	<X> Xon/xoff
<C> Chat Mode	
<F> File transfer	

Buffer OFF Echo OFF Xon/Xoff OFF
Auto LF OFF

0000 Characters in buffer : 6000 free

Select ?

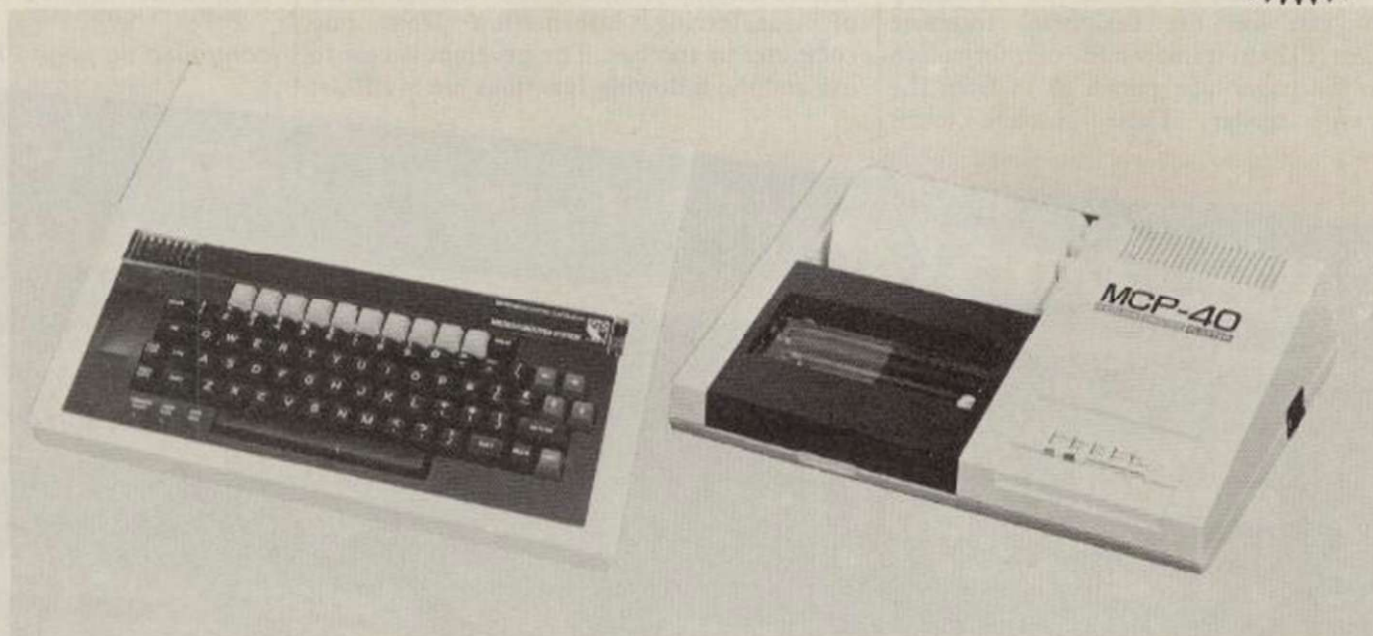
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The heart of the system will be the BBC Model B with its full colour 32K Rom computer with text and graphics and 80 column text screen, extended Microsoft basic, built-in assembler 1 MHZ tube interface sideways, ROM and RS 423 A/D Converter. Also included in this package will be the MCP40 printer — the world's No. 1 printer. It uses four different colour pens to achieve its plotting facilities and gives you four colour printing capabilities. You will also get the Acornsoft Creative Graphic Cassette and Acorn Creative Graphic Book plus graph and chart book and all cables.

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12 MODEMS

available for Spectrum Apple BBC and other RS232 Computers. Special software available for the above models.

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13 NEW DOUBLE DENSITY

DISK CONTROLLER FOR THE BBC MICRO

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14 SOFTWARE



15 BBC Hardware



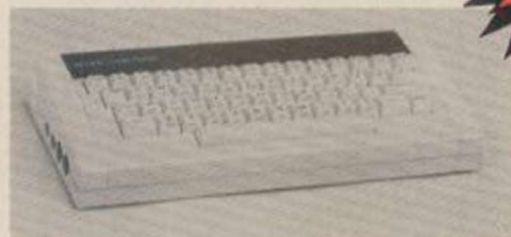
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Model B
£399

A full colour 32K ROM computer with text and graphics modes up to 640 x 256 graphics and 80 column text screen, extended Microsoft basic, built-in assembler 1 MHz and tube interface, sideways ROM, RS 423 A/D converter.

16 Electron

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17 The Apple IIe Business Package

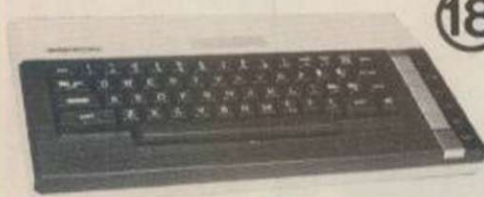


The heart of the system is the Apple IIe Microcomputer. This package includes Disk Drive with Controller plus a second Disk Drive, a suite of Business Software which includes Sales Ledger, Sales Invoicing, and Purchase Ledger by Peachtree Software International, TV Modulator, £25 Apple Software Rebate Voucher, Certificates, Micronetti/Prestel Discount Software Certificates and a catalogue of Hardware and Software

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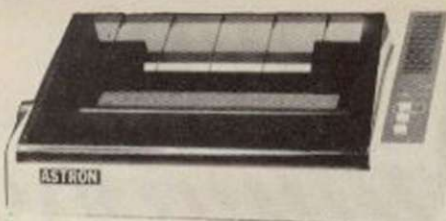
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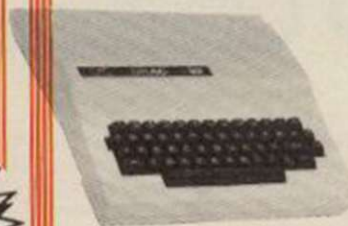


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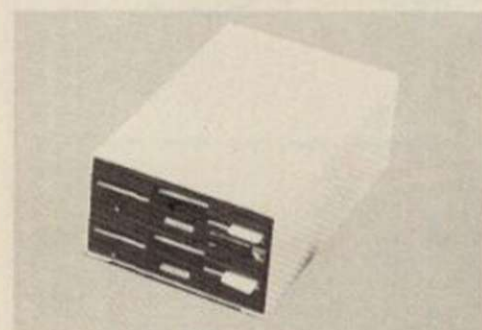
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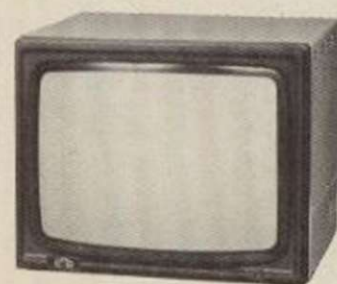
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⑪ MONITORS



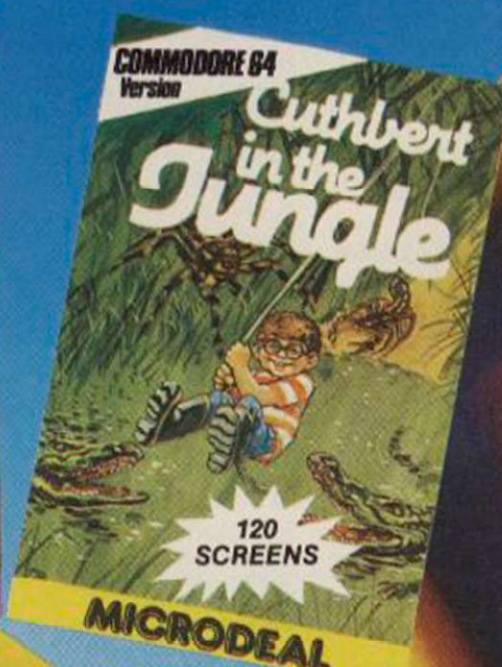
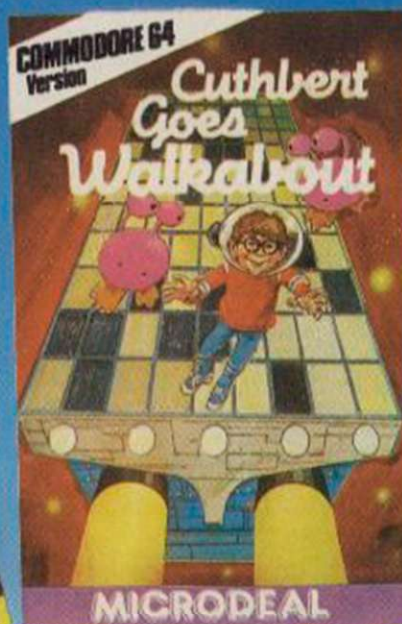
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NOW AT LAST!

Cuthbert

ON THE

Commodore 64

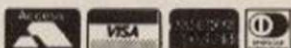


Yes at last those fantastic top selling games for the Dragon are now available for your Commodore 64. Avoid those Marauding Moronians in "Cuthbert Goes Walkabout". Fight for survival in "Cuthbert in the Jungle" or plunder the Moronians planet in "Cuthbert in Space". These great games are a "must" for your software collection.

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POWER

	Word	Parity	Stop	02:55
0	7	Even	2	
1	7	Odd	2	
2	7	Even	1	
3	7	Odd	1	
4	8	None	2	
5	8	None	1	
6	8	Even	1	
7	8	Odd	1	
<R>eceive 300 <S>end 300				
Select ?_				

(continued from page 85)

There is a menu for initialising the RS-423 interface. You can select one of the word length — stop bit — parity patterns by typing one of the numbers in the left-hand column and the baud rates shown at the bottom of the screen can be altered by typing either R or S.

The receive or send rate steps through the usual selection of rates from 75 baud to 9,600 baud each time one of the keys is pressed. Setting up the interface is very easy.

When you dial a number with your computer connected to the telephone line and somebody or something answers at the far end you may want to do any one of several things. If it is a friend on the line, you will probably want to talk to him or her before using your computer to send messages or programs down the line.

Hear answering tone

If you are connected to British Telecom's Packet Switched Network, you will hear only the answering tone of a modem at the far end. In this case you will have to identify yourself to the remote computer, and to do this the communications package you are using must allow you to type on the keyboard, sending the characters to the remote computer which will echo them back to your machine for display on your VDU.

Commstar calls this the Chat mode because you can hold a dialogue with the remote computer where keystrokes on either machine will show up on your terminal — you can Chat with someone at the far end.

While you are chatting with the remote computer you may wish to send a message that you have already prepared and stored in a file. Equally likely, you may want to receive a program or file from the remote computer, storing this in the memory of your machine until you can save it on tape or disc.

You can access the transmit and receive file functions from Chat mode without having to return to the main menu. Commstar will not load a file from tape or disc while in Chat mode but will send the current contents of the buffer to the remote computer or load material from the remote machine into the buffer.

You can then return to the main menu and save the buffer to the current filing system. This structure for the Commstar program works well and is really the only possible architecture for a computer that may be used with a tape-filing system.

Sending the contents of the buffer to the RS-423 port is a way of uploading a file to the remote computer. Some systems respond to a set of buffer control codes — Forum 80 is an example — and Commstar has an option that will automatically open the buffer in the remote machine and close it again when the file transfer is complete.

If the buffer in your machine fills up while material is being transmitted from the remote machine, Commstar will issue an XOff character to try and halt the flow. At the same time the copy-to-buffer operation is switched off and you can save the buffer to tape or disc.

After wiping the buffer, you may turn on the copy-to-buffer option and send an XOn signal to resume the halted transmission. If you are using a cassette tape recorder running at 1,200 baud it will take you about three and a half minutes to save the 24K buffer.

That is not going to do your telephone bill any good but it is unlikely to happen often as it will take nearly 15 minutes continuous reception to fill the buffer at 300 Baud.

Obviously a disc system will save the buffer much more quickly and you can reckon to download a file of any size from the remote computer if you have discs at your end.

Using the 80-column screen reduces the size of the buffer to about 9,000 characters, which is still adequate for many of the transactions you are likely to make.

The file-transfer section of Commstar is the most sophisticated section of the program. Data is sent down the line using Ward Christensen protocols and handshaking. The data is automatically broken up into 128-byte blocks and each block is sent with its own number and checksum.

If the remote computer signals an error, the block will be retransmitted up to 10 times to try to overcome the corruption. As the manual says: "This system virtually assures perfect data transfer even under extreme conditions such as temporary loss of carrier signal, excessive line noise or even temporary dis-

connection of the modem."

It is necessary, of course, for the remote computer to use compatible software. Communications between two BBC Micros using Commstar should be very easy under most line conditions. With the BT packet switched network I have experienced little trouble both in London and the country using the ordinary buffer output and copy-to-buffer options.

Commstar will send and receive both ASCII text files and binary-coded programs. Some machine-code or Basic instructions can look like control codes to many communications programs and Commstar overcomes this problem by translating the buffer contents into expanded ASCII files before transmission or back into binary codes before the buffer is stored on tape or disc.

The transfer of programs

This option is enormously useful as it allows the transfer of machine-code programs just as easily as letters, patients' records or sales reports.

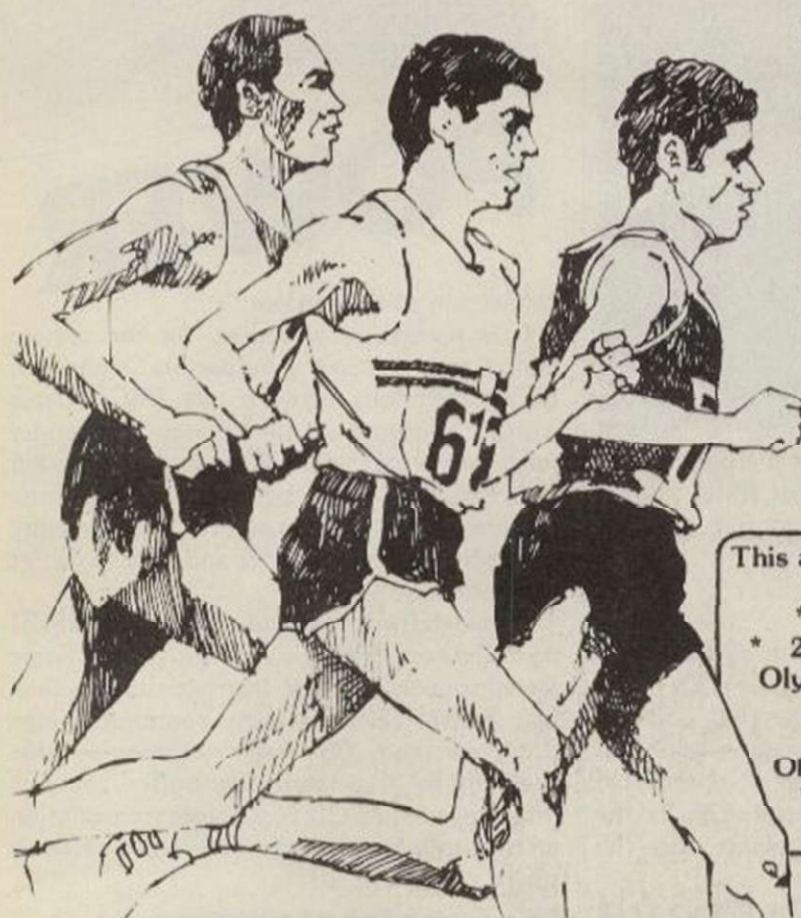
The Commstar chip is supplied with a 37-page manual which includes a glossary of telecommunications terms and a good index. The manual is clearly written and laid out. A registration postcard is included in the front of the manual which offers follow-up information and program updates to genuine purchasers of the package.

Each section of the manual is easy to understand and if Commstar is the first additional ROM chip you fit to your BBC computer, you will have little difficulty if you work through the instructions in the manual.

Apart from very slight lapses, the Commstar manual is a model for others to imitate. It would have been helpful, for example, for the manual to have confirmed that files produced by Commstar are compatible with Wordwise and View — they are. Similarly, you can prepare a text file with one of the BBC word processors and then upload it to a remote computer using Commstar.

Pace Software Supplies has an excellent reputation for backing-up sales. Commstar is a super piece of software, allowing you to communicate with microcomputers and mainframes; receiving and transmitting text, data and programs. The package works well and offers excellent value for money, I expect to see it used widely in university laboratories, homes, schools and doctors' surgeries. ■

OLYMPICS 84



48k ZX Spectrum

To celebrate this summer's Olympic Games in Los Angeles, STORM SOFTWARE offers you an unique "two program" package. Crammed full of facts and figures - OLYMPICS '84 - gives great flexibility in looking at results.

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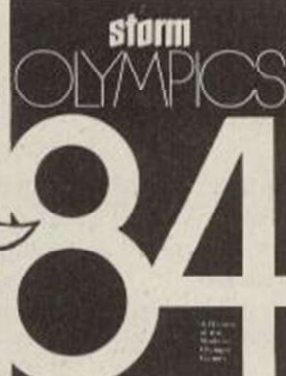
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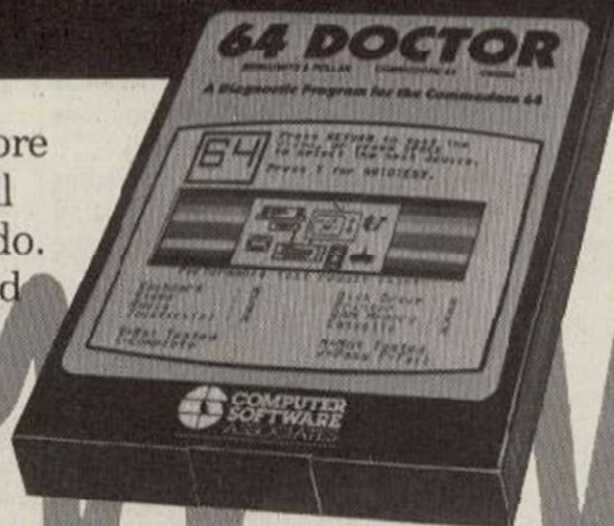
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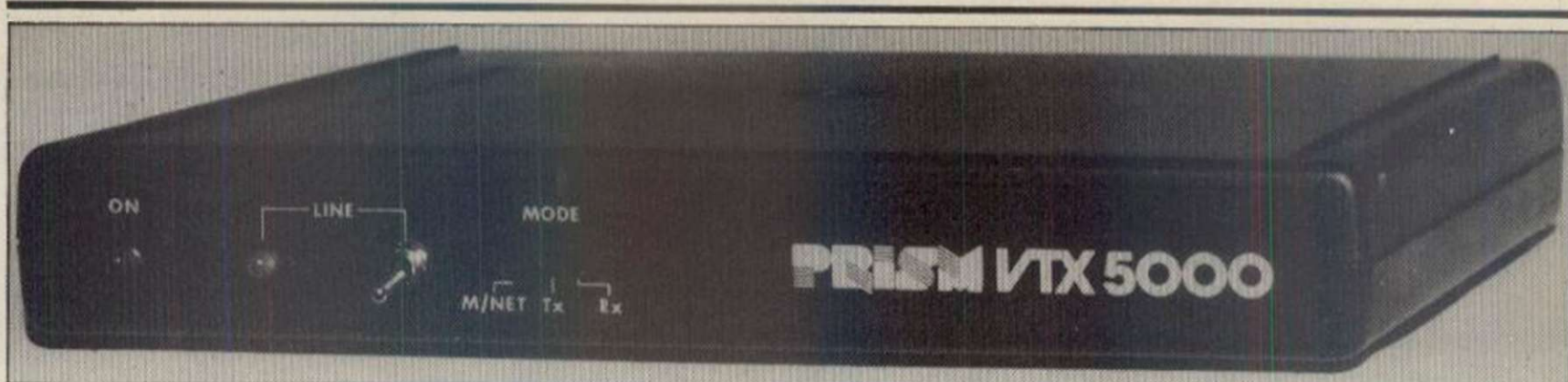
So as well as saving you pounds in having someone check through the whole system for a fault, 64 Doctor will give you peace of mind.

You can give your system a check-up by visiting any good computer store including selected branches of Laskys, W.H. Smith and Boots.

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PRESTEL ADAPTORS

THIS REVIEW COVERS several packages available for the popular BBC Micro and ZX Spectrum computers which allow them to operate as viewdata terminals. This means that services such as Prestel can be accessed without having to buy a special terminal.

The VTX 500 ZX Spectrum adaptor consists of a flat black plastic box containing the modem which fits under the computer. There is a ribbon cable and connector which plugs into the back of the Spectrum and further devices such as a printer can be connected on to a spare connector on the ribbon cable. There is a telephone type cable out of the VTX 5000 which will plug into a standard British Telecom wall socket.

Your telephone then plugs back into a socket on the back of the adaptor, allowing you to use the phone normally. The BBC system supplied had a slightly larger box which attached to the computer via a cable into the RS-423 connector. This box could then be placed under the telephone. In addition the BBC adaptor had an EPROM

Jack Russell reviews adaptors for the Spectrum, BBC and ZX-81 micros.

chip which had to be fitted into one of the spare "sideways" ROM sockets in the computer.

When the Spectrum is switched on a start up screen appears inviting you to press any key. When this is done the Main Menu is displayed. To get to this stage on the BBC Micro the command.

*MIC.

needs to be typed. It is from this menu that all the features of the package can be controlled. Items on the menu include: log on, terminal operation, save/view frames, print frames, download and mailbox editor.

To use Prestel it is necessary to log on to the system. When the menu option to do this is selected the program prompts for your ID number. This is then sent to Prestel when a

MODEM



POWER

connection is established. Upon dialling up the Prestel phone number and flipping the switch on the modem to on line the screen is cleared and the Prestel sign-on frame appears.

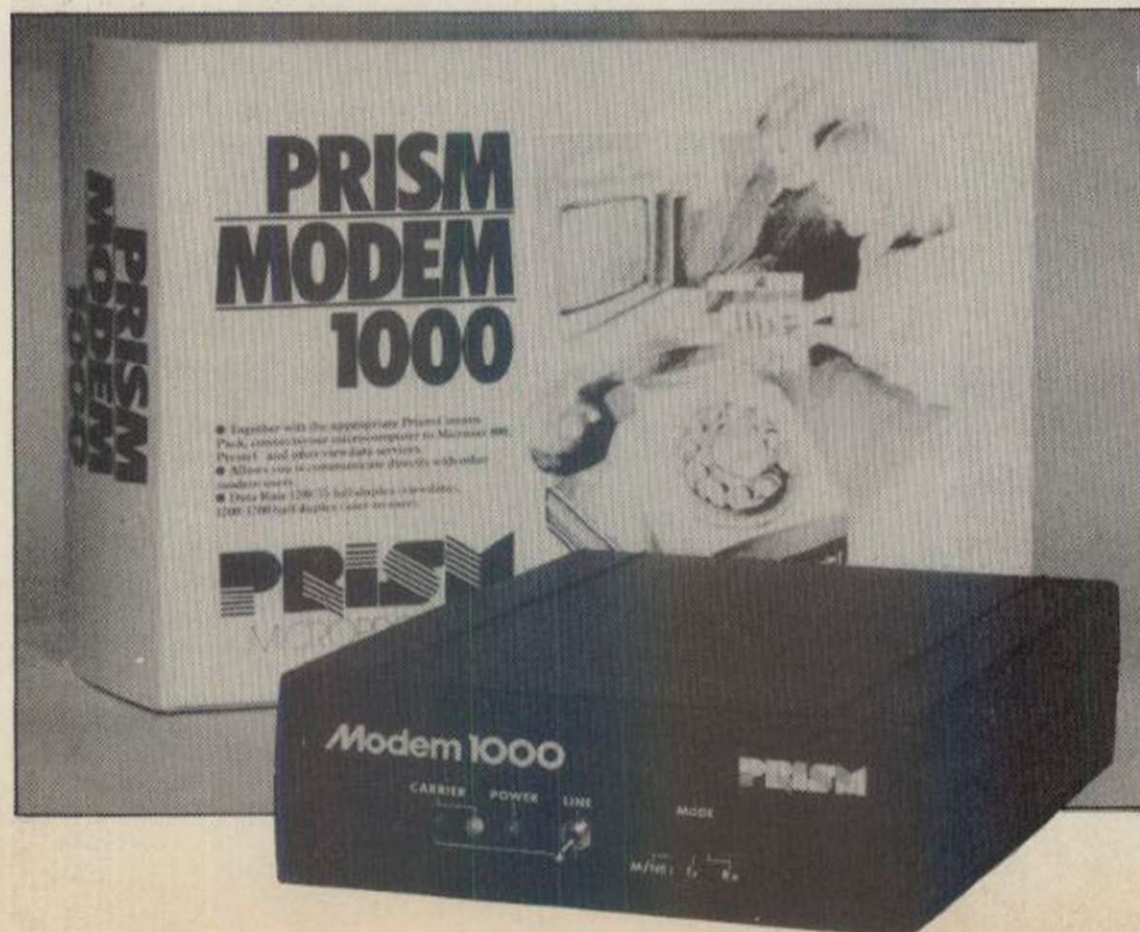
All normal Prestel facilities can then be used. Frames can be read just by pressing the number keys and the special keys * and £. To return to the menu the keys Caps Shift and Enter on the Spectrum or Tab on the BBC are used. This allows the use of other functions in the package such as saving frames on tape or disc, printing and so on.

Everything appeared to work correctly so next I tried downloading a 'free' telesoftware program. The downloading operation seemed to work well but I was not too impressed with the quality of the 'free' programs on offer. On the Spectrum it is necessary to restart the terminal program after downloading because the support program gets overwritten by the downloaded one. When this restart function is performed the main menu is displayed again and selecting the Terminal option takes you back to Prestel.

The final function provided was an editor to prepare mailbox frames while offline. I was not impressed by this part of the package as only one line at a time can be edited and it is not possible to correct errors in earlier lines; the whole message must be retyped from the start. I'm sure that improvements could be made here. However, I think that the Mailbox facility is one of the most exciting things about Prestel.

The modem hardware worked well and I had no trouble downloading some software. The Spectrum package in particular was impressive in being able to produce a 40 column full colour Prestel display.

(continued on next page)



(continued from previous page)

THE ZX-81

THE ONLY Sinclair ZX-81 Prestel adaptor on the market is sold by Microcomputer Resources Ltd. It can operate with either acoustic coupled or direct connect modems which are now available from several sources.

The adaptor consists of a small black box similar to a 16K RAMpack. The ZX-81 expansion bus is connected right through the box allowing the continued use of other peripherals such as a ZX Printer. To use the Prestel adaptor a 16K RAM pack is required.

40 column display

Upon plugging everything together and powering up the normal cursor appears. The documentation I had was marked preliminary but it was quite comprehensive and covered all the adaptor functions in some depth. To start the adaptor a Rard USR 8192 command is typed. The display that then appears has 40 columns instead of the usual 32.

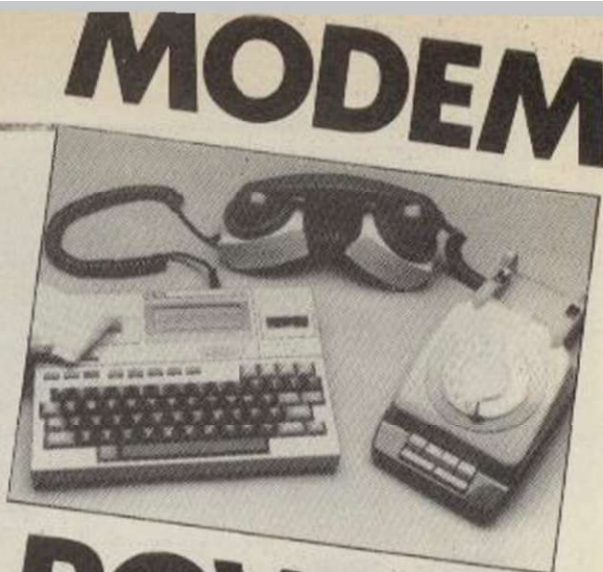
Unfortunately, it is not possible to read all 40 columns at once on a standard TV screen. However, there are some function keys provided that cause the whole screen display to scroll sideways. I found this feature inconvenient to use especially when trying to read Prestel screens, as on things like news stories the complete 40 column screen width is used.

The Prestel double height and graphics modes are fully supported by the adaptor —

AND POWER PRESTEL

quite a programming feat by the software writer. Facilities missing are flash, conceal/reveal, and all the colour features. I got used to the lack of these things after a few minutes.

Other facilities provided by the adaptor are the ability to save Prestel frames in memory and to recall them for later viewing. If necessary the frames can be written on to tape using the fast cassette interface provided. I found saving and recalling frames easy but the tape playback level had to be set very carefully. It is possible to download telesoftware from Prestel which can then be saved and run in the normal way. Any program line that is garbled or does not comply with ZX-81 Basic is headed by a Rem statement for later editing by the user.



It is also possible to use the adaptor in 'local' mode where Prestel-like frames can be composed by typing characters on the keyboard. It is a very time consuming process as to make for example a double height line it is necessary to press Shift and Newline simultaneously followed by E to send an ASCII 'Escape' character, followed by Shift M to go into double height mode. To use the Prestel graphics character set requires a similar feat of key pressing.

Once a frame has been composed on the screen it can be stored on cassette, in memory or even transmitted to Prestel. In this way mailbox messages can be prepared off-line then sent to their destination in one burst, minimising telephone charges. I tried sending some mailboxes using this method and it worked very well.

To add even more versatility into this adaptor design, it can be used to access other databases which do not use the special Prestel characters, but instead require a "dumb" terminal. This allows use of, for example, many of the bulletin board services now operating. The same facilities of frame storage, printing and so on are still available in this mode.

In conclusion, the adaptor is a very impressive piece of work when considered against the limitations of the ZX-81 display and keyboard. It certainly offers the lowest cost way of accessing Prestel as well as other databases. It costs £29.95 and is available from: Microcomputer Resources, 1 Branch Road, Park Street Village, St Albans, Hertfordshire.



THE CHALLENGE IS WITHIN YOUR GRASP



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KEMPSTON JOYSTICK INTERFACE FOR THE ZX SPECTRUM

Allows the use of any Atari/Commodore type joystick with the popular ZX Spectrum computer. With well over 100 games on the Spectrum now compatible with the joystick this is a must for any Spectrum owner who wants the power of a joystick added to the power of the Spectrum. Simply plugs into the edge connector at the back of the Spectrum. No modifications necessary.

Some games you can buy were produced before Joysticks were available for the ZX Spectrum. With the aid of Kempston conversion tapes these games can now be played with any of the Kempston range of joysticks.



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TRADE
ENQUIRIES
WELCOME

Most items are available from W H Smith, Boots, Spectrum Computer Centres and good computing shops or direct from:

KEMPSTON
MICRO ELECTRONICS LTD

Unit 30 Singer Way, Woburn Road Industrial Estate,
Kempston, Bedford, MK42 7AF. Tel: (0234) 856633 Telex: 826078 KEMPMI G

killed by being pushed.

There are six machine-code routines in this game. The first transfers data from ROM into high-memory. The next four handle the screen and the last is used for sound affects.

Poke 65418 with PITCH

65419 with SPAN

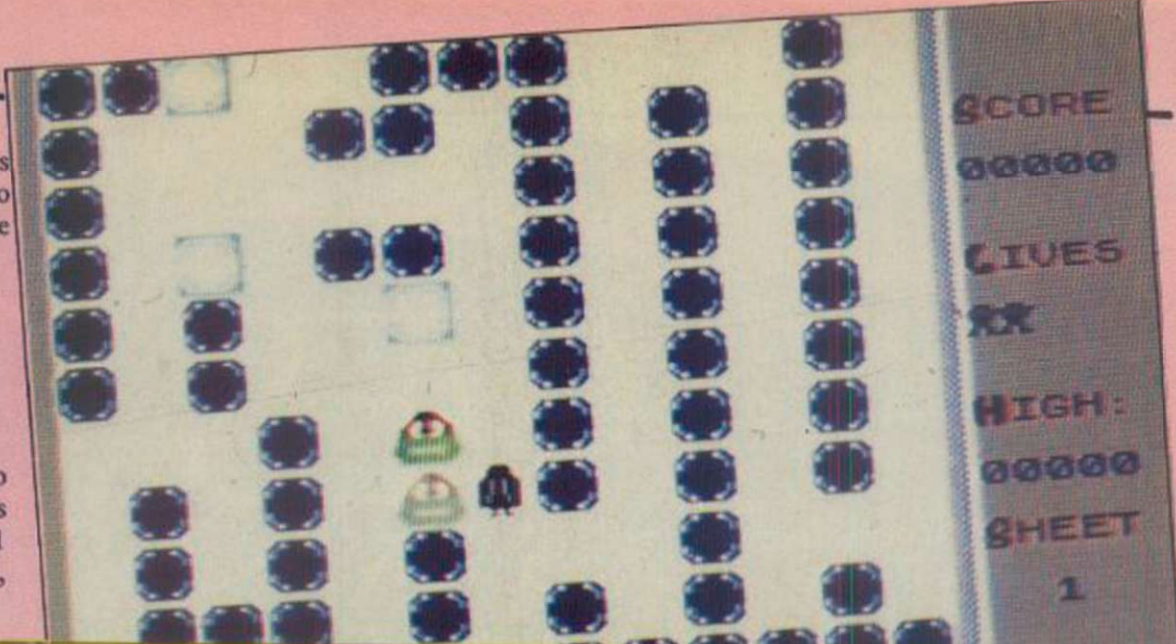
65421 with DURATION

65440 with 28 for up or 29 for down.

The sound routine is called by:

PRINT USR USR "G".

Pongo is available on cassette for those who rather not write it in from the listing. It is available from: Ultram Software, 1 Beaconstone, Beacon Road, Crowborough, East Sussex, TN6 1AZ.



```
1000 LET SC=SC+1: RETURN
5004 LET X=A
5005 IF X=C THEN IF B=D THEN LET
C=C-2
5006 IF X=E THEN IF B=F THEN LET
E=E-2
5009 LET X=X-2
5010 LET AT=(ATTR (X+2,B)=253)
IF ATTR (X,B) < 121 THEN IF ATTR
(X,B) < 253 THEN IF X=0 THEN PRI
NT AT X,B: INK 1+4*AT: FLASH AT
"ab":AT X+1,B:"cd": PRINT AT X+2
,B:"":AT X+3,B:""
5020 IF X=0 OR ATTR (X-2,B)=253
OR ATTR (X-2,B)=121 THEN GO TO 5
060
5050 GO TO 5005
5060 IF X=C THEN IF B=D THEN LET
KILLS=KILLS+1: PRINT AT C,D:
"AND G=2)+("yz" AND G=3):AT C+
1,D:("yz" AND G=2)+(" " AND G=3
): BEEP .5,10: LET Z=USR USR "G"
: PRINT INK 1+4*AT: FLASH AT AT
C,D:"ab":AT C+1,D:"cd": LET SC=5
C+50: GO SUB 9995
5070 IF X=E THEN IF B=F THEN LET
KILLS=KILLS+1: PRINT AT E,F:
"AND G=2)+("yz" AND G=3):AT E+
1,F:("yz" AND G=2)+(" " AND G=3
): BEEP .5,10: LET Z=USR USR "G"
: PRINT INK 1+4*AT: FLASH AT AT
E,F:"ab":AT E+1,F:"cd": LET SC=5
C+50: GO SUB 9997
5080 IF AT THEN IF BON THEN LET
A1=X: LET A1=B: GO SUB 7500
5100 RETURN
5090 IF ATTR (A+4,B)=121 OR ATTR
(A+4,B)=253 OR A=13 THEN IF AT
253 THEN BEEP .2,30: PRINT AT A
+2,B:"jc":AT A+3,B:"ba": BEEP .1
,40: PRINT AT A+2,B:"":AT A+3
,B:"": LET SC=SC+1: RETURN
5094 LET X=A
5095 IF X=C THEN IF B=D THEN LET
C=C+2
5096 IF X=E THEN IF B=F THEN LET
E=E+2
5099 LET X=X+2
5010 LET AT=(ATTR (X-2,B)=253)
IF ATTR (X,B) < 121 THEN IF ATTR
(X,B) < 253 THEN PRINT AT X,B: IN
K 1+4*AT: FLASH AT "ab":AT X+1,B
:"cd": PRINT AT X-1,B:"":AT X-
2,B:""
5016 IF X=20 OR ATTR (X+2,B)=121
OR ATTR (X+2,B)=253 THEN GO TO
5060
5050 GO TO 5005
7000 CLS: PRINT AT 10,10:"OK YO
U WIN": BEEP 1,-40: BEEP .1,30:
PRINT USR 0
7100 FOR X=1 TO 2: PRINT AT C,D:
"yz":AT C+1,D:"yz":AT E,F:"yz":A
T E+1,F:"yz": BEEP .1,10: OVER 1
: NEXT X: OVER 0: CLS: PRINT AT
10,10:"WELL DONE":TAB 10:"NEW S
HEET": LET SHEET=SHEET+1: LET 0=
PEEK 23673
7110 FOR X=1 TO 15: BEEP .02,13:
BEEP .02,39: NEXT X: PRINT AT 1
7,10:INT (B/12): "MINUTE"+("S" A
ND INT (B/12) < 1):TAB 10:5*(B-12
+(INT (B/12))): "SECONDS": LET B
=250-B: PRINT TAB 10:"BONUS=":B:
LET SC=SC+B: BEEP .2,20: BEEP .
3,30: GO TO 16
7200 PRINT AT 10,7: FLASH 1:" OR
HE OVER ": POKE 65440,29: POKE 6
5421,100: POKE 65419,200: LET Z=
USR USR "G": POKE 65440,28: POKE
65421,2: POKE 65419,100: PRINT
AT 10,7: FLASH 1: INK 2: PAPER 6
:"ANOTHER GO ?"
7210 LET Z=USR USR "G": LET A$=I
NKEY$: IF A$="Y" THEN: GO SUB 9
900: GO TO 15
7220 IF A$="N" THEN PRINT USR 0
7230 GO TO 7210
7500 REM DIAMOND ALIGNMENT
7520 LET U=ATTR (A1+2,B1)=253
7530 LET X=A1:0 AND ATTR (A1-2,B
1)=253
7540 LET Y=ATTR (A1,B1+2)=253
7550 LET Z=B1:0 AND ATTR (A1,B1-
2)=253
7560 IF X THEN IF (U OR (ATTR (A
1-4,B1)=253 AND A1>2)) THEN GO T
```

```
0 7700
7570 IF U THEN IF ATTR (A1+4,B1)
=253 THEN GO TO 7700
7580 IF Z THEN IF (Y OR (ATTR (A
1,B1-4)=253 AND B1>2)) THEN GO T
O 7700
7590 IF Y THEN IF ATTR (A1,B1+4)
=253 THEN GO TO 7700
7600 RETURN
7700 BEEP .5,40: BEEP .4,50: LET
BON=10+(INT (RND*100)): LET LI1
=15: LET LI2=15
7710 LET Y=USR USR "B"+4: FOR
Y=0 TO 127: BEEP .003,Y/2: POKE
22528,Y: LET L=USR USR "A": NEXT
Y: LET L=USR USR "D"
7720 FOR Y=BON TO 0 STEP -10: PR
INT AT 10,9:"BONUS:"Y:"": LET
SC=SC+10: LET 3$=STR$ SC: PRINT
AT 5,32-LEN 3$,3$,BRIGHT 0,3$:AT
15,32-LEN 3$,13$ AND 3C>HI: BEE
P .02,20
7725 NEXT Y
7730 LET L=USR USR "D": LET BON=
0: RETURN
9020 RESTORE 9000: FOR F=USR "A"
TO USR "K"+7
9030 READ A
9040 POKE F,A
9050 NEXT F
9060 RETURN
9100 DATA 33,0,33,17,1,33,1,0,3
,237,176,201
9110 DATA 17,30,195,33,0,64,1,0
,27,237,176,201
9120 DATA 33,30,195,17,0,64,1,0
,27,237,176,201
9130 DATA 33,0,61,17,39,252,1,0
,2,237,176,201
9140 DATA 243,17,200,100,33,13,5
,3,72,92,31,31,31,14,254,238,15,2
,37,121,67,15,254,37,32,244,28,21
,32,232,251,201
9150 DATA 0,0,60,66,139,161,161
,139,66,60
9000 DATA 102,231,231,255,255,23
1,231,102
9010 DATA 56,120,112,96,96,102,6
,3,30,28,54,98,102,120,190,70,124
,56,65,170,124,56,40,68,193
9020 DATA 0,31,51,111,95,95,127
,127,0,243,204,246,250,250,254,25
4,127,127,95,95,111,51,31,0,254
,254,250,250,246,204,243,0
9030 DATA 0,0,3,7,15,25,49,51,0
,0,192,224,240,152,140,204,121,12
7,127,255,240,255,127,63,153,254
,254,255,15,255,254,252
9050 DATA 0,3,7,15,12,12,0,0,1
92,224,240,184,254,240,224,9,11
,11,7,4,4,8,14,224,224,192,13
6,30,32,0
9060 DATA 0,192,224,224,240,48,4
8,16,0,3,7,15,29,127,15,7,144,20
8,208,224,32,32,16,112,7,7,7,3,1
7,10,4,0
9070 DATA 0,3,7,7,15,29,29,29,0
,192,224,224,240,184,184,184,29,2
7,27,31,22,2,6,0,184,216,216,243
,232,54,96,0
9080 DATA 0,3,5,6,10,22,23,23,0
,192,160,96,60,232,232,232,23,23
,23,31,23,2,6,0,232,232,232,248,2
32,64,96,0
9090 DATA 13,127,249,243,255,224
,127,15,224,126,159,207,255,7,25
4,224
9100 DATA 60,126,126,126,126,219
,219,219,255,191,153,229,126,126
,126,60
9110 DATA 163,34,163,34,163,34,1
63,34
9120 DATA 163,34,42,21,21,42,34
,163
9200 DATA 13,0,13,0,0,4,4,8,12,4
,16,20,4,0,4,3,15,3,4,8,10,0,4
,12,3,20,12,0,20,15,0,4,20,3,14
,20,2,13,24
9210 DATA 12,12,2,4,5,8,6,16,6,2
0,3,20,10,14,14,4,13,3,13,13,20
,10,22,18,22
9215 DATA 2,22,2,2,2,12
9220 DATA 7,2,13,2,6,13,6,10,13
,10,2,13,14,2,10,13,14,13,13,2,14
,22
9230 DATA 16,3,0,13,3,13,12,18,1
6,13,20,13,22,3,4,2,6,2,3,2,10,2
```

```
12,5,8,6,10,6,12,3,16,10,22
9235 DATA 10,4,6,4,3,12
9240 DATA 11,0,13,2,0,4,6,4,12,3
,16,13,0,0,4,10,4,20,12,0,4,14,3
,16,13,0,4,13,16,13,13,0,13,20
9250 DATA 13,12,4,13,4,3,6,12,6
,16,6,16,10,4,12,3,14,20,14,4,16
,3,13,12,13,16,20
9255 DATA 4,13,2,16,13,13
9260 DATA 9,12,2,0,2,12,2,12,16
,4,0,3,6,3,2,13,12,0,13,16
,0,13,20,0,13,24
9270 DATA 3,20,2,20,4,4,3,4,10,0
,3,16,14,0,13,16,22
9275 DATA 0,4,6,4,3,10
9280 DATA 10,0,20,2,0,20,6,0,6,1
0,18,20,10,0,20,14,0,6,13,20
,18,6,14,22,0,4,24,16,20,24
9290 DATA 15,10,0,4,20,4,10,3
,14,8,10,10,10,12,14,12,10,13,14
,16,10,13,10,20,14,20,2,22,13,22
9295 DATA 3,4,12,4,10,13
9500 FOR N=0 TO 21: PRINT AT N,2
6: INK 0:"": NEXT N
9500 FOR N=0 TO 21: PRINT AT N,2
6: INK 1:"": NEXT N
9510 IF 0=24 THEN LET LI1=10: PO
KE 65419,65: POKE 65421,10: POKE
65440,28: BEEP .1,20: GO SUB 99
00
9520 IF F=24 THEN LET LI2=10: PO
KE 65419,65: POKE 65421,10: POKE
65440,29: BEEP .1,20: GO SUB 99
00
9530 GO TO 130
9700 LET A$="
```



```
9710 FOR N=31 TO 2 STEP -1
9720 FOR F=0 TO 12 STEP -1: BEEP
.01,-F: PRINT AT F,N-2:"ef": INK
4:A$( (32+F)+N):AT F+1,N-2: INK
7:"gh": INK 4:A$( (32+F)+N+32):AT
F+2,N:A$( (32+F)+64+N): NEXT F
9730 NEXT N
9740 FOR F=12 TO 0 STEP -3: FOR
N=F TO 15+(F/3): PRINT AT N,0:
"AT N+1,0:"ef":AT N+2,0:"gh"
BEEP .01,N: NEXT N: BEEP .1,-40
: PRINT AT N,0:"":AT N+1,0:"yz"
: NEXT F
9750 FOR F=0 TO 19: BEEP .01,16-
F: PRINT INK 5:AT F-1,0:"":AT
F,0:"ab":AT F+1,0:"cd": NEXT F
9760 LET B$=" PRESS ANY KEY TO P
LAY "
FOR F=27 TO 2 STEP -1
: BEEP .01,F: BEEP .01,F+2: PRIN
T AT 20,F:"cd":AT 21,F:"po":B$
( TO 28-F): NEXT F
9770 PRINT AT 3,1:A$: PRINT AT 1
7,8:"BY JONATHAN WARD":AT 13,9:
& ANDREW NEVE":AT 19,13:"K1993"
FOR F=1 TO 10: PRINT OVER 1: IN
K 7:AT 0,1:A$: NEXT F
9780 PAUSE 1: PAUSE 0
9790 RETURN
9900 LET Z=USR USR "G": POKE 654
19,100: POKE 65421,10: POKE 6544
0,23: RETURN
9995 LET BI1=10: LET C=2+INT (RN
D*11): LET D=2+INT (RND*13): LET
CI=C: LET DI=D: LET LI1=0: IF A
TTR (C,D)=253 OR (C=A AND D=B) T
HEN GO TO 9995
9996 RETURN
9997 LET BI2=10: LET E=2+INT (RN
D*11): LET F=2+INT (RND*13): LET
EI=E: LET FI=F: LET LI2=0: IF A
TTR (E,F)=253 OR (E=A AND F=B) T
HEN GO TO 9997
9998 RETURN
```


158

93

F 1248

CAVES OF MARS

X1

X2

X3

SYSTEMS ARE GO

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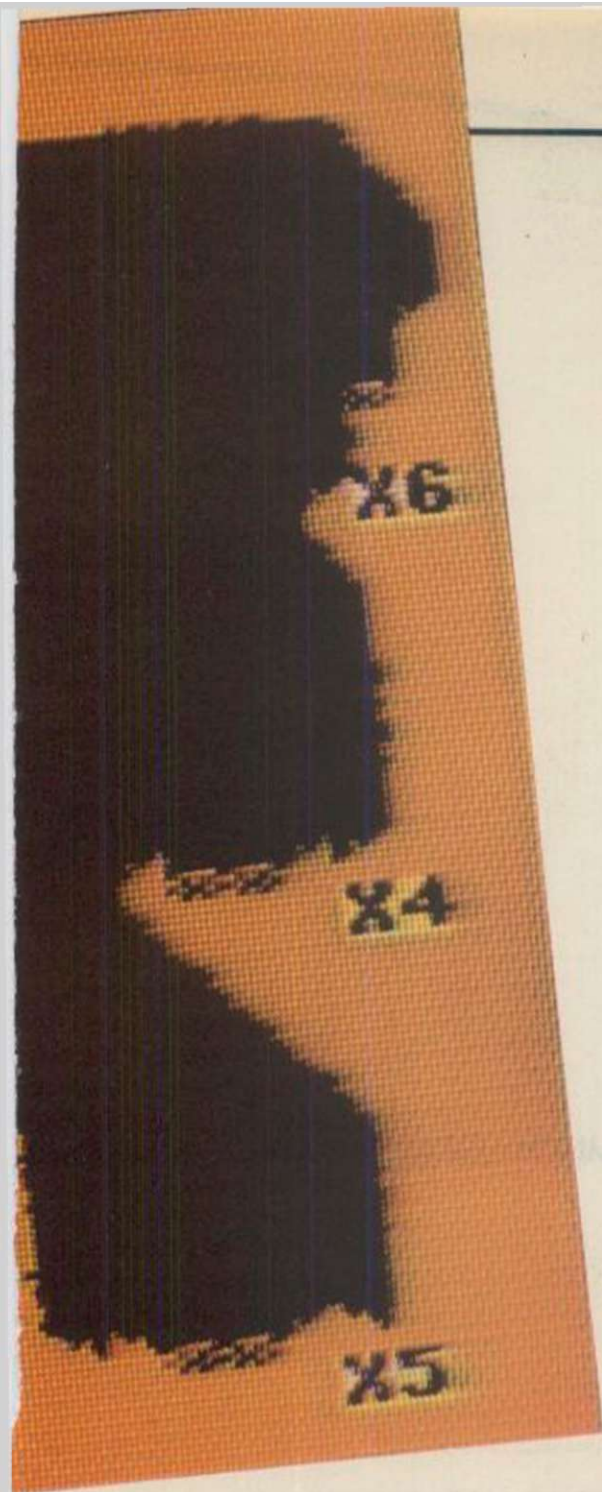
100 PRINT "J" FOR=1701000 NEXT PRINT
110 PRINT "***** COMMODORE 64 CAVES OF MARS *****"
120 PRINT "*****GRAPHICS FORMING UNDER PROGRAM*****"
130 PRINT "*****PLEASE WAIT*****"
200 REM CHARACTER SET TO RAM - LOCATION 12289
210 PRINTCHR$(142)
220 POKE32,48:POKE56,48:CLR
230 POKE56334,PEEK(56334)AND254
240 POKE1,PEEK(1)AND251
250 FORI=0T0519:POKEI+12288,PEEK(I+53248):NEXT
260 FORI=1024T01543:POKEI+12288,PEEK(I+53248):NEXT
270 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334)OR1
280 POKE53272,(PEEK(53272)AND248)OR12
300 REM GENERATE 26 NEW CHARACTERS - LOCATIONS 12504 AND 12768
310 FORI=170168:READX:POKE12504+I,X:NEXT
320 FORI=170408:READX:POKE12768+I,X:NEXT
330 DATA255,254,252,248,240,224,192,128,255,127,63,31,15,7,3,1
340 DATA0,1,3,7,15,31,63,127,0,128,192,224,240,248,252,254
350 DATA102,24,204,19,48,195,24,198
360 DATA0,0,0,0,0,0,0,0,156,222,123,91,91,123,222,156
370 DATA0,126,195,255,255,36,126,195,57,123,222,218,218,222,123,57
380 DATA1,3,6,12,12,6,3,1,195,102,48,24,0,0,0,0
390 DATA128,192,96,48,48,96,192,128,3,12,48,192,192,48,12,3
400 DATA195,195,102,102,60,60,24,24,192,48,12,3,3,12,48,192
410 DATA255,255,255,255,255,255,255,255,0,0,0,126,219,102,219
420 DATA0,3,55,63,127,255,255,255,195,24,3,124,60,6,224,27
430 DATA0,192,236,252,254,255,255,255,127,31,15,31,7,3,3,0
440 DATA255,255,255,255,255,255,255,255,216,255,255,127,127,127,255,255,127
450 DATA254,248,248,252,248,224,192,0,252,255,254,254,254,255,255,254
460 DATA51,204,48,236,3,120,6,108
470 DIMSC$(10),SC(10):FORX=17010:SC$(X)="111 111 111 111":SC(X)=0:NEXTX
500 REM TITLE PAGE
510 PRINT "J" POKE53280,0:POKE53281,0:LD=0:MD=0:FL=0
520 PRINT:PRINT:PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
530 PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
540 PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
550 PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
560 PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
570 PRINT:PRINT:PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
580 PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
590 PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
600 PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
610 PRINT "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J" "J"
620 PRINT:PRINT:PRINT:PRINT:PRINT "BY BRUCE CHESSELL 1983"
630 FOR=1705000 NEXT
700 REM INSTRUCTIONS
710 PRINT "*****MISSION INSTRUCTIONS*****":PRINT:PRINT
720 PRINT "J" YOU ARE IN CONTROL OF A MISSION TO:PRINT
730 PRINT "J" LAND SUPPLIES INSIDE THE CAVES OF MARS:PRINT
740 PRINT "J" LIMITED FUEL REPLENISHMENT IS:PRINT
750 PRINT "J" AVAILABLE IF YOUR MODULE LANDS SAFELY:PRINT:PRINT
760 PRINT "J" MODULE CONTROLS:PRINT
770 PRINT "J" DIRECTION THRUST LANDING AREAS
780 PRINT "J"
790 PRINT "J" KEYS X C V F5 F7:PRINT

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800 PRINT "J" CHR$(34):PRINT
810 PRINT "J" HIT ANY KEY TO CONTINUE "
820 K=PEEK(197):IFK=64THENLO=LO+1:IFLO=700THENOOTO 4010
830 IFK<64THEN850
840 OOTO820
850 PRINT "*****SCORING*****"
860 PRINT:PRINT "J" POINTS AND EXTRA FUEL GIVEN FOR EACH SUCCESSFUL LANDING"
870 PRINT:PRINT "J" SPEED VERTICAL POINTS EXTRA"
880 PRINT "J" GIVEN FUEL"
890 PRINT:PRINT "J" UNDER 5 300 50 100"
900 PRINT "J" 6 TO 9 200 50"
910 PRINT "J" 10 TO 20 100 20"
920 PRINT "J" OVER 20 MODULE DESTROYED"
930 PRINT:PRINT "J" POINTS AND FUEL ARE MULTIPLIED"
940 PRINT "J" BY X FACTORS FOR LANDING AREAS"
950 PRINT:PRINT "J" DISPLAYED DURING FLIGHTS "
960 PRINT:PRINT "J" H: HORIZONTAL SPEED F: FUEL"
970 PRINT "J" LEFT"
980 PRINT "J" V: VERTICAL SPEED"
990 PRINT:PRINT "J" HIT ANY KEY TO START "
1000 REM START GAME
1010 K=PEEK(197):IFK=64THENMD=MD+1:IFMD=200THENOOTO4010
1020 IFK<64THEN1110
1030 OOTO1010
1100 REM SET MAIN VARIABLES
1110 F=2000:SC=0
1120 VX=36:VY=0:X=0:Y=3:SP=1104:J=SP:E=3:M=34:V=48:H=3:S=2:T=32:O=1.6
1200 REM SET SOUND REGISTERS
1210 VO=54296:W=54276:RD=54277:SR=54278:HF=54273:LF=54272
1220 GOSUB3010
1300 REM MODULE MOVEMENT LOOP - TO 1590
1310 K=PEEK(197):IFK=64THENM=0:B=0:D=32:POKEH,0:OOT01460
1320 IFK<1THEN1420
1330 IFK=23THENM=33:E=1:V=-1:OOT01400
1340 IFK=31THENM=35:E=2:V=1:OOT01400
1350 IFK=20THENM=34:E=3:V=40:OOT01400
1360 IFK=3THENM=2:H=3:OOT01400
1370 IFK=6THENM=4:H=6:OOT01410
1380 A=0:B=0:D=32:POKEH,0:OOT01460
1390 REM JET SOUND
1400 IFS=2THENPOKEVO,7:POKEH,129:POKESR,240:POKEHF,212:POKELF,230
1410 IFS=4THENPOKEVO,14:POKEH,129:POKESR,240:POKEHF,26:POKELF,156
1420 IFE=1THENM=5:B=0
1430 IFE=2THENM=5:B=0
1440 IFE=3THENM=0:D=-5
1450 D=M+H
1460 IFF>0THEN1490
1470 A=0:B=0:D=32:POKEH,0
1480 PRINT "*****OUT OF FUEL*****":PRINT
1490 VX=VX+A:VY=VY+D+B
1500 X=X+VX/2:Y=Y+VY*(D+B)/2:F=F-(ABS(A)+ABS(B)):IFF<0THENF=0
1510 DX=INT(X/400):DY=INT(Y/400)
1520 N=SP:Z=J

```

MAKE AS MANY landings as possible inside the caves of Mars to provide the exploration parties with supplies. You have limited fuel so use it sparingly. Each successful landing gains points and extra fuel but select your landing areas carefully according to pilot skill and the amount of fuel you have left. The more difficult the landing area, the more points and fuel gained.

Remember that gravity alone will cause your downward speed to increase, which can only be reduced by expending precious fuel. Sideways speed will remain constant unless you alter this by using your thrusters. Module controls are:

Direction of Thrust

Key X — left
C — downward
V — right

Jet power

Key F5 — minimum
F7 — maximum

The softer the landing the more points scored and the more fuel taken on board, so keep your speed down at impact. Fine control is available using minimum jet power. Watch your speed dials closely and try to keep your touch down speed under 5. Anything over 20 at impact and your module is destroyed — but do not give up! As long as fuel remains you will be provided with another machine to fly.

The program contains full instructions and will auto start a demonstration routine if left to its own devices. However, you can take control at any time during the demonstration and the game will start after you land or crash!

This is an addictive game and as there is a scoreboard which records the names and points achieved by the 10 best players, it offers lots of opportunity to compete with your friends.

Although there are 26 special graphic characters created and used, the program is written entirely in Basic, so you might learn quite a lot from studying how it works. There are plenty of Rem statements to help you

understand the logic.

The main sequences are as shown below:

Lines	
200-280	move two sections of ROM character set to RAM to enable the creation of new characters.
300-460	generates 26 new graphic characters.
470	sets up array of 10 highest scores.
500-620	provides title page.
700-990	provides game instructions.
1100-1210	sets main variables and sound registers.
1300-1590	module movement loop.
1600-1690	module landed or crashed assessment.
1700-1780	crashed module explosion and sound.
1800-1920	points and extra fuel assessment.
2000-2130	scoring routine.
2200-2320	display score table and start new game.
2400-2470	end game sequence to reset computer to normal graphics.
3000-3260	sub routine to create screen display.
4000-4040	sub routine to auto start game.

Colours have been chosen for good contrast and to show up well on the average colour television set.

You can cheat if you wish and give yourself more fuel by altering variable F in line 1110 but do not overdo it or the challenge will disappear.

There are no machine-code routines in this game, nor are they necessary, but if you feel like rising to the bait, you will find it possible to add any number of additional routines to this game. Here are a few ideas.

Try modifying the program so that the same module can be taken off again after each successful landing. Don't forget to Poke back the little bits of Mars the take-off jet blast removes.

```

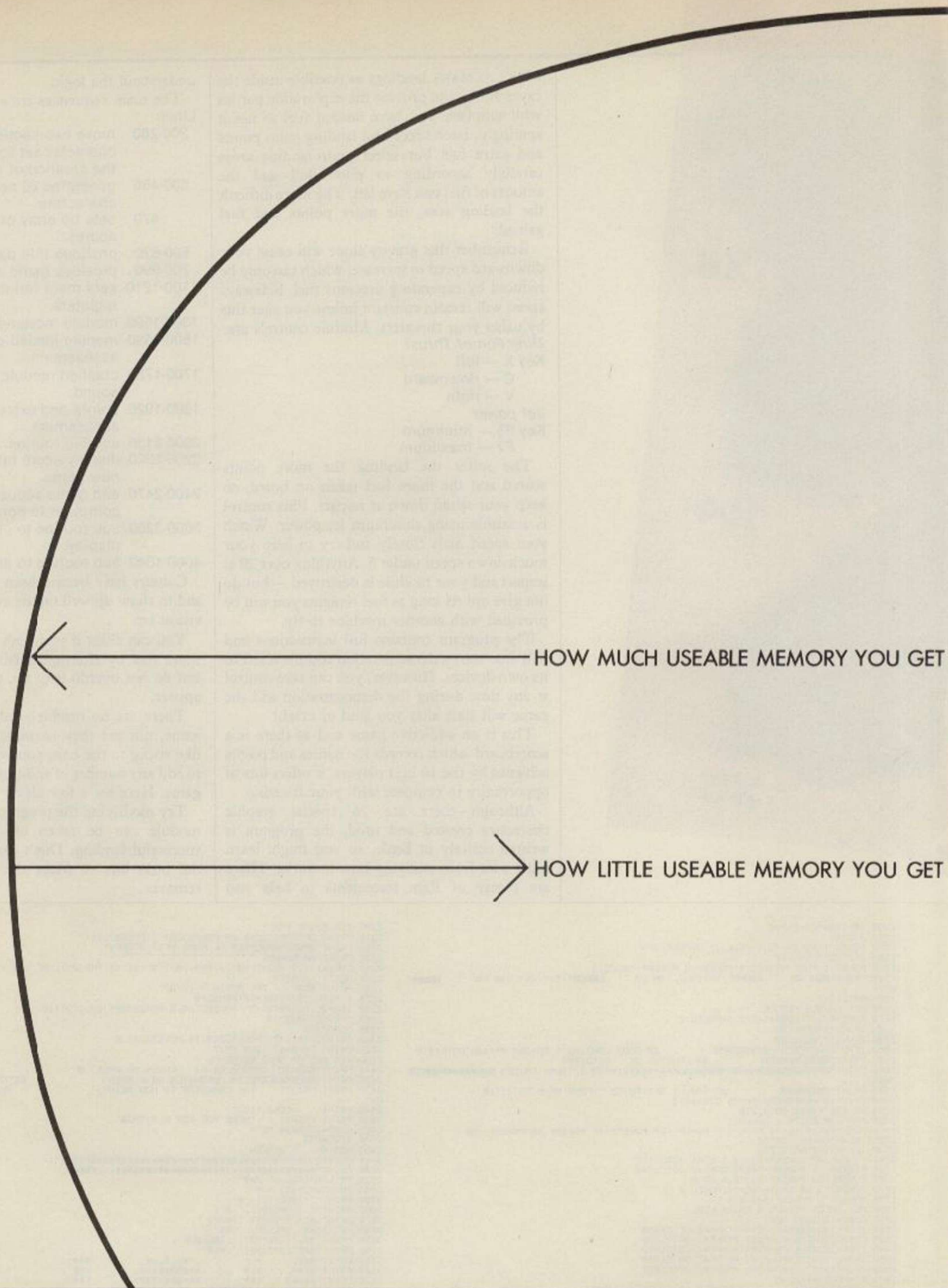
1530 SP=1104+DX+DY*40
1540 J=SP+V
1550 POKEZ,T:POKEH,32:T=PEEK(J):U=PEEK(SP)
1560 IFU<32THEN1610
1570 POKEJ,D:POKEJ+54272,8:POKEH,M:POKEH+54272,3
1580 PRINT"*****HI *****":INT(VX):"MI VMI *****":INT(VY):"MI FI *****"
M:F
1590 GOTO1310
1600 REM LANDED MODULE
1610 POKEH,M:POKEH+54272,3:POKEH,8
1620 IFU<43THEN1660
1630 IFV<20THEN1660
1640 IFV<5THENPRINT"*****"
1650 PRINT"*****"
1660 PRINT"*****"
1670 PRINT"*****"
1680 IFV<10THENPO=200:PF=50:GOTO1810
1690 PO=100:PF=20:GOTO1810
1700 REM EXPLOSION & SOUND
1710 FORK=1500STEP-1:POKEV,X:POKEH,129:POKEH,47:POKEH,48:POKEH,200
1720 IFEX=1THENGOTO1750
1730 IFEX=2THENGOTO1750
1740 POKEH,45:POKEH+54272,1:EX=1:GOTO1770
1750 POKEH,31:POKEH+54272,2:EX=2:GOTO1770
1760 POKEH,63:POKEH+54272,4:EX=0
1770 FORS=1TO 50:NEXTS:NEXTX:POKEH,0
1780 POKEH,U:POKEH+54272,8
1800 REM CHECK POINTS & EXTRA FUEL
1810 FORD=1TO100:NEXT
1820 IFSP<1304THENPO=PO*6:PF=PF*6:GOTO1880
1830 IFSP<1504THENPO=PO*1:PF=PF*1:GOTO1880
1840 IFSP<1624THENPO=PO*4:PF=PF*4:GOTO1880
1850 IFSP<1824THENPO=PO*3:PF=PF*3:GOTO1880
1860 IFSP<1904THENPO=PO*2:PF=PF*2:GOTO1880
1870 PO=PO*5:PF=PF*5
1880 PRINT"*****"
1890 SC=SC+PO:IF=IF+PF
1900 FORD=1TO3000:NEXT
1910 IFPL=1THENRETURN
1920 IFZ<0THEN1120
2000 REM SCORING
2010 FORH=1TO9:PRINT"J":FORI=1TO100:NEXTI:PRINT"*****"
2020 NEXTD:NEXTH:FORX=1TO2000:NEXT
2030 PRINT"*****"
2040 IFPL=1THENRETURN
2050 FORX=1TO2000:GETR#NEXTX:Z=0:FORX=1TO10:IFSC<SC(X)THENZ=X:X=11
2060 NEXTX:IFZ<0THEN2080
2070 IFZ<0THEN2090
2080 FORD=1TO8000:NEXT:GOTO2200
2090 PRINT"*****"
2100 INPUT"*****":R#IFLEH(R#)>15THENR#<LEFT$(R#,15)
2110 IFZ<0THEN2130
2120 FORX=1TO2STEP-1:SC(X+1)=SC(X):SC(X+1)=SC(X):NEXTX
2130 SC(Z)=SC:SC(Z)=R#

```

```

2200 REM SCORE TABLE
2210 PRINT"J":POKE53272,28:POKE53280,1:POKE53281,7
2220 PRINT"*****CAVES OF MARS BEST SCORES*****"
2230 PRINT"*****"
2240 FORK=1TO10:PRINT"X":TAB(10):"MI":SC(X):TAB(20):"MI":SC(X)
2250 NEXTX:X=PRE(0)
2260 PRINT"*****"
2270 K=PEEK(197):IFK=64THEN2270
2280 IFK=25THENPRINT"J":POKE53280,8:POKE53281,8:GOTO1110
2290 IFK=39THEN2310
2300 GOTO2270
2310 PRINTCHR$(147):POKE53280,14:POKE53281,6
2320 PRINT:FORD=1TO1000:NEXT
2400 REM END OF GAME SEQUENCE
2410 PRINT"*****"
2420 PRINT"*****"
2430 PRINT"*****"
2440 PRINT"*****"
2450 PRINT"*****"
2460 FORD=1TO5000:NEXT
2470 SYS64738
3000 REM SET UP SCREEN
3010 PRINT"*****"
3020 PRINT"*****"
3030 PRINTSPC(36):"/":
3040 PRINTSPC(38):"/":
3050 PRINT"/":SPC(38):"/":
3060 PRINT"/":SPC(36):"/":
3070 PRINT"/":SPC(35):"/":
3080 PRINT"/":SPC(35):"/":
3090 PRINT"/":SPC(33):"/":
3100 PRINT"/":SPC(33):"/":
3110 PRINT"*****"
3120 PRINT"*****"
3130 PRINT"*****"
3140 PRINT"*****"
3150 PRINT"*****"
3160 PRINT"*****"
3170 PRINT"*****"
3180 PRINT"*****"
3190 PRINT"*****"
3200 PRINT"*****"
3210 PRINT"*****"
3220 PRINT"*****"
3230 PRINT"*****"
3240 PRINT"*****"
3250 PRINT"*****"
3260 POKE2023,42:POKE56295,8:RETURN
4000 REM AUTO START
4010 PL=1:GOSUB1110
4020 PRINT"J"
4030 IFSC<0THENGOSUB2030:FORX=1TO3000:NEXT
4040 GOTO510

```

■ If you saw a computer labelled 32K, 48K or 64K you'd assume it had a large memory. Right?

Wrong. These figures bear little relationship to the actual amount of useable memory left once the computer is performing functions like text, colour, sound and even more importantly, high resolution graphics.

The Commodore, for instance, claims an "elephantine" 64K memory, yet uses up 26K producing high resolution graphics.

Under the same conditions, the Dragon 32K leaves 24K of useable memory, the Lynx 48K just 14K.

And the BBC Micro and Acorn Electron leave the operator a miserly 9K to play with.

However, there is one computer specifically designed to cope with these normal working functions as a matter of course. The new Oric Atmos 48K.

Why, even when you add peripherals like the new micro disc drive unit and colour printer (see technical details overleaf), its useable memory is never less than a healthy 37K.

Which not only caters for all the standard applications you'd expect from any home computer, but also for advanced

WITH THE NEW ORIC ATMOS.

WITH OTHER HOME COMPUTERS.

programming and very sophisticated games.

Talking of games, the new Oric Atmos starts off with a major advantage over most new computers, since it takes most of the software already written for the Oric-1.

And like the Oric-1, it has a powerful loudspeaker and amplifier inside its case.

The same unit, in fact, that prompted "Which Micro" (November) to quote... "At full volume this machine can compete with most arcade games. Its sound facilities have more in common with the £400 Beeb, than the rather pathetic beep of the Spectrum..."

Yet the Oric Atmos 48K costs a modest £170, including all the leads and adaptors you need to get it going.

But then what else would you expect from a British Company recognised for offering so much for so little?



The new Oric Atmos 48K. **ORIC**

Now we've whetted your appetite, here's something to get your teeth into.

Printer Technical Specifications

Printer/ Plotting system	Ball Point Pen, 4 colour
Plotting speed: (horizontal) (vertical)	52 mm/sec (2.05ips) 73 mm/sec (3.08ips)
Printer Speed	12 characters per second
Resolution	0.2 mm/step (0.00787 inch)
Effective plotting range	96 mm (3.804 inch) x axis, divided into 480 steps. (No limit in y direction)
Characters per line	80 or 40 text mode (determined by software in graphics mode)
Characters per line	INT (480/n+1) * 6) for 0=n=15
Accuracy (repetition) (movement) (distance)	0.2 mm max 0.3 mm max 0.5% max (x-axis) 1% (y-axis)
Pen life	250 metres (825 feet)
Parallel interface	8-bit parallel Uses STROBE and ACKNOWLEDGE
Temperature range storage	18.3 to 35°C (65 to 96°F) -40 to 71°C (-40 to 160°F)
Humidity range	10% to 80% relative non- condensing
Power supply	Switching power supply input 100-120 VAC 200-240 VAC
Dimensions	10 3/4" wide 6 7/8" deep 2 1/2" high

Atmos Technical Specifications

CPU	6502 A
Memory	Choice of 16K or 48K RAM
Memory (48K Model)	Minimum 48K RAM, max 64: 16K ROM external control signals allow use of full 64K RAM or maybe used externally to increase ROM/RAM
Language	Extended Microsoft basic
Keyboard	Typewriter style and pitch, 57 keys, standard computer layout, additional cursor control keys, autorepeat facility, tactile and acoustic feedback
Display	Output for B&W or colour TV, RGB output for colour monitor.
Text format	40 line x 28 rows
Character set	Similar to Teletext format, standard ASCII double height, flashing, 80 user definable characters
Graphics	240 x 200, 8 colours
Graphic Facilities	Points, lines, circles
Sound	Internal loudspeaker and amplifier. 3-Channel sound synthesiser envelope control, amplitude control 8 octaves, noise channel
Storage	Most cassette recorders via DIN socket 300 or 2400 BAUD. Disc Drive.
Interface	Centronics, expansion port, Hi-fi, RGB Monitor, UHF TV, cassette recorder
Other	Warm reset to regain control without clearing program or data

Micro Disc Technical Specifications

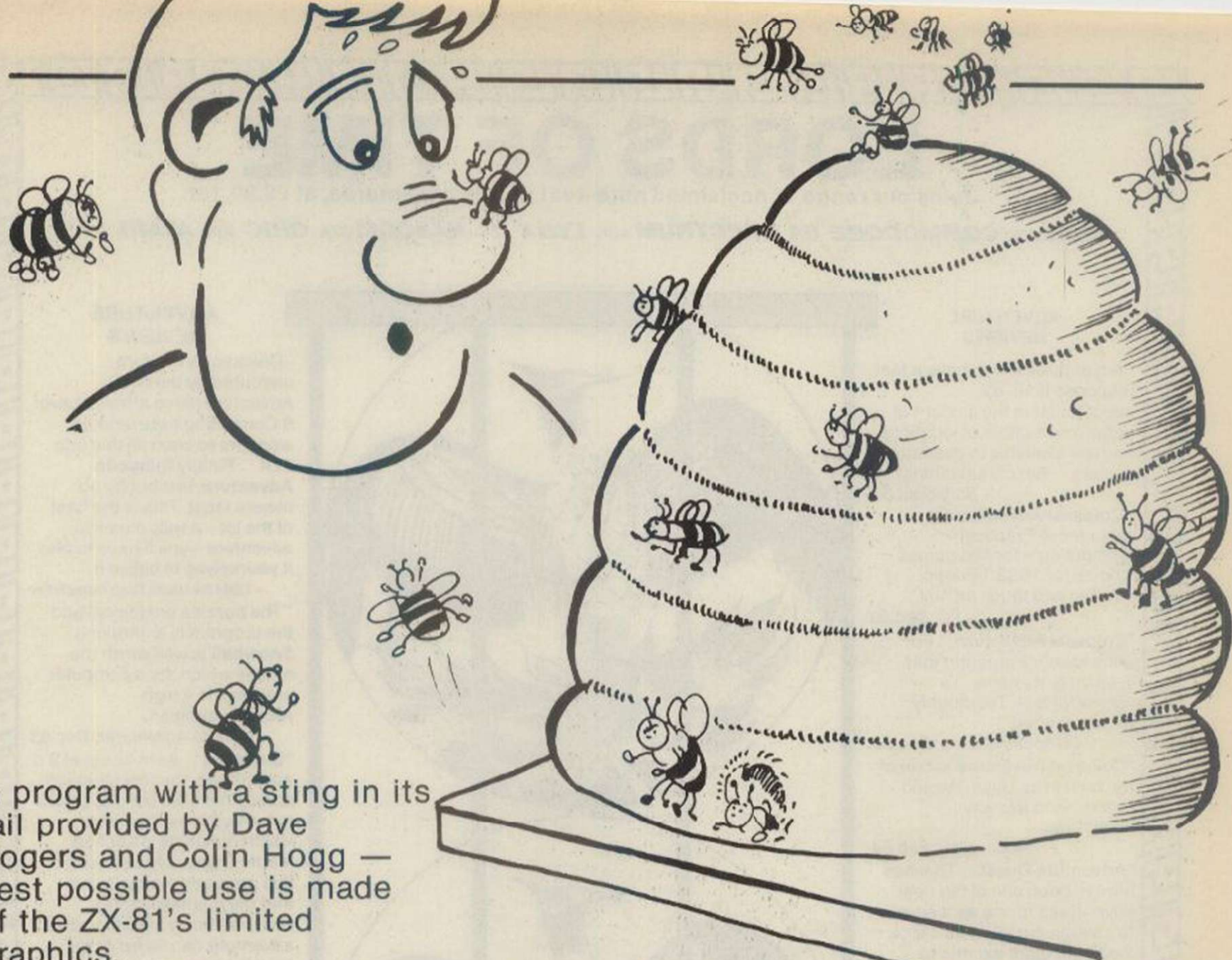
Formatted Capacity	160K bytes per side (double density as standard)
No. of Tracks	40 (80 available as option at a future date)
No. of Sectors	16
Bytes per Sector	256
Transfer Rate	250K Bits/Sec
Supports up to 599 files per side, four drives single or double sided, 40 or 80 track. User definable configuration allows mixing of drive types including 5 1/4" (five and a quarter inch) Extensive wild card facilities Copy allows merging of basic and machine code files	
<u>Utilities</u>	
The Utilities are as follows:	
1. Backup	Copy a whole disc
2. Copy	Copy a file to another
3. Del	Delete a file allowing wildcards
4. Dir	Display directory listing
5. Drv	Set the default drive number
6. Format	Format and initialise a disc
7. Load	Load a file (code data or basic)
8. Protect	Change protect status of file
9. Recall	Recall a basic array from a file
10. Ren	Rename a file
11. Save	Save a file (code, data or basic)
12. Store	Store a basic array as a data file
13. Sys	Change system configuration

Prices and data correct at time of going to press.
Specifications on the above models may change without notice.

Available at Alders, Currys, Dixons, Greens, Harrods, Laskys, Rumbelows, Spectrum and Zappo
Computer Centres.



ORIC



A program with a sting in its tail provided by Dave Rogers and Colin Hogg — best possible use is made of the ZX-81's limited graphics.

HIGH-RISE HIVE

FOR ANY ZX-81 owners who are feeling forgotten and unsupported, Hi-Rise-Hive provides a professional quality, fast, and addictive game, featuring progressive difficulty from easy to almost impossible and up to 20 independently roaming bees.

The player is also cast as a bee, but one that is trying to monopolise the honey by taking it from the cells of a multi-storey hive. The other bees of course, being the socially responsible creatures that they are, are busy, constantly refilling the empty cells, but are understandably peeved about having to do this and so will 'sting' you given the opportunity.

Behaviour is realistic

The movement algorithm has been designed to make their behaviour as realistic as possible, for example if you are near one and sit still it may just go away, on the other hand one may decide to chase you quite a distance along a gallery, forcing you to jump off. Note that you can always jump off or slide down the outside of the hive but the only way *up* is via the internal ladders.

In fairness to Nature we wouldn't want to induce Apiaphobia in anybody, especially any younger readers, so don't forget that bees will

not normally bother you if you don't bother them. If you are unlucky enough to encounter the subspecies 'Adansonii' this may not apply but fortunately this aggressive strain is not native to Britain.

The hive is almost five screens in size, one third of which is underground labyrinth. It is all held in *one* rather huge string, so you will only ever see a certain section at a time starting at the top, but those with ZX printers can cheat and see the whole lot simply by typing
LPRINT H\$

If you can clear out every cell on a given screen then you proceed to the next section, the hive becoming wider and more and more bees appearing at each successive level. By the time you reach the underground section, the maximum of 20 bees will have been reached and the screen will be literally a hive of activity.

If you should manage to clear the final screen you then start at the top of the mega-hive, and we really do not envisage any player being able to clear more than a few screens of this — in the rare event of completing the mega-hive you will go on to an even wider mega-mega-hive and so on.

For variety, the layout of honey cells is random each game you play, but it is designed

to tend towards more interesting structures. For example, there will often be clusters of cells where bees can enter, and by depositing 'honey' behind them, trap themselves in. These situations are of course somewhat dodgy to try and clear out since the entombed bee, although it *looks* dormant, is in fact bursting to get out! You may *have* to let it out sooner or later to clear the screen.

Crash can occur

Essential addresses in this program are:

Spare byte 16508 — This is used to store the character of whichever square the player next intends to move onto. It is used by *both* the Basic and the machine code, for replacing characters when the man moves (line 30) or is hit by a bee (hex 410F).

Spare byte 16417 — Holds the number of active bees, from zero up to 20. It is Poked by line 510 to vary the number of bees flying on different screens. Beware: a crash can occur if it is Poked much above 20.

USR 16514 — Sets up bees in their start positions at top of the screen.

USR 16546 — Moves each active bee on space, does 'screen cleared' scan and checks if player has been hit. Normally returns to Basic

(continued on page 105)

LORDS OF TIME

Joins our range of acclaimed pure-text puzzle adventures, at £9.90, for:

BBC 32K COMMODORE 64 SPECTRUM 48K LYNX 48K NASCOM 32K ORIC 48K ATARI 32K

ADVENTURE REVIEWS

"Adventures which have a fast response time, are spectacular in the amount of detail and number of locations, and are available to cassette owners... Simply smashing!"

— *Soft, Sept 83*

"Colossal Adventure is included in Practical Computing's top ten games choice for 1983: 'Poetic, moving and tough as hell.'"

— *PC, Dec 83*

"Colossal Adventure... For once here's a program that lives up to its name... a masterful feat. Thoroughly recommended"

— *Computer Choice, Dec 83*

"Colossal Adventure is one of the best in its class. I would recommend it to any adventurer."

— *Acorn User, Feb 84*

"Adventure Quest... This has always been one of the best adventures for me as it seems to contain the lot. In all it took me about eight months to solve."

— *PCW, 18th Jan 84*

"To sum up, Adventure Quest is a wonderful program, fast, exciting and challenging. If you like adventures then this one is for you"

— *NILUG issue 1.3*

"Colossal Adventure is simply superb... For those who want to move onto another adventure of similar high quality, Dungeon Adventure is recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!"

— *Educational Computing, Nov 83*

ADVENTURE REVIEWS

"Colossal Adventure... undoubtedly the best Adventure game around. Level 9 Computing have worked wonders to cram all this into 32K... Finally Dungeon Adventure, last but by no means least. This is the best of the lot - a truly massive adventure - you'll have to play it yourselves to believe it."

— *CBM 64 Users Club Newsletter*

"The puzzles are logical and the program is enthralling. Snowball is well worth the money which, for a computer program, is a high recommendation."

— *Micro Adventurer, Dec 83*

"Snowball... As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denizens... this program goes to prove that the mental pictures conjured up by a good textual adventure can be far more vivid than the graphics available on home computers."

— *Which Micro?, Feb 84*

"Lords of Time. This program, written by newcomer Sue Gazzard, joins my favourite series and is an extremely good addition to Level 9's consistently good catalogue... As we have come to expect from Level 9, the program is executed with wonderful style - none of those boring 'You can't do that' messages! Highly recommended."

— *PCW, 1st Feb 84*



MIDDLE EARTH ADVENTURES

1: COLOSSAL ADVENTURE

A complete, full size version of the classic mainframe game "Adventure" with 70 bonus locations added.

2: ADVENTURE QUEST

Centuries have passed since the time of Colossal Adventure and evil armies have invaded The Land. The way is long and dangerous; but with cunning you can overcome all obstacles on the way to the Black Tower, source of their demonic power, and destroy it.

3: DUNGEON ADVENTURE

The trilogy is completed by this superb adventure, set in the Dungeons beneath the shattered Black Tower. A sense of humour is essential!

THE FIRST SILICON DREAM ADVENTURE

1: SNOWBALL

The first of Pete Austin's second trilogy. The giant colony starship, Snowball 9, has been sabotaged and is heading for the sun in this massive game with 7000 locations.

THE LORDS OF TIME SAGA

7: LORDS OF TIME

Our congratulations to Sue Gazzard for her super design for this new time travel adventure through the ages of world history. Chill to the Ice-age, go romin' with Caesar's legions, shed light on the Dark Ages, etc.

Price: £9.90 each (inclusive)

Level 9 adventures are available from good computer shops, or mail-order from us at no extra charge. Please send order, or SAE for catalogue, to:

LEVEL 9 COMPUTING

Dept Y, 229 Hughenden Road,
High Wycombe, Bucks HP13 5PG
Please describe your computer

(continued from page 103)

with line number 10, but returns with line number 600 if the player has been hit, or with 300 if the screen has been cleared. The Basic then 'goes to' one of these lines.

USR 16749 — This routine is equivalent in Basic to:

```
Let score = score + 2
Print at 23, 15; score
Goto 50
```

It is however, much faster and it formats the printing with leading zeros to allow a rapid count-up visual effect. The score is held only on the screen, not in a variable, and screen positions (23,15) to (23,20) must start off as six zeros.

Listing includes hex loader

The main listing includes the hex loader, so type in all the Basic first, not forgetting the first four Rem lines as detailed below. Then Run 9000 and enter the Hex data one line at a time, including the check figures but not the spaces.

Line 1 must be typed in as Rem followed by exactly 103 characters, any will do. The line number of this is then edited to 2, 3 and 4 to produce four identical lines, making available a total of 432 bytes for the machine code. You only actually have to type in 280 of these via the hexloader, the remainder are left for use as 'stores' where the machine code routine will eventually hold information on individual 'bees'.

The self-checking hexloader given is as near foolproof as you can get, it simply will not let you enter wrong data or lines in the wrong order. The check figures consist of the sum of each line of hexdata plus 20 times the line number. It is statistically highly improbable that exactly equal-but-opposite errors would occur, cancel out, and admit incorrect data. When finished, the loader will remind you to tape a back-up copy of the program, in case it crashes when Run.

Once you are satisfied that the program is working properly the hexloader lines can be



deleted and some final copies taped. Remember that the ZX-81 Saves its variables along with the program and H\$ is rather a huge string to unnecessarily save on tape! So always use Goto 9990, as this includes a 'clear' before autosaving, reducing save/load time by over two minutes.

Importance of graphics

It is most important to realise the importance of the graphics characters used, particularly the greys. The grey on key A is Outside Grey in which bees are triggered to move diagonally for four moves — or until they hit something — then change direction, giving an erratic bee-in-flight motion. The player however will fall through outside grey until another object is hit. The grey on key H is Inside Grey and in this the bees are triggered to move horizontally and vertically so as to wander along the passageways. The player can move freely through inside grey.

(continued on next page)

Main variables

S Screen position of player.
IP Intended position (players next move).
DK Deck level of hive (0 to 60).
MC Machine code subroutine calls.
STGS Strings (0 to 30).
H\$ Hive string.
E\$ Empty string — actually contains spaces and minuses.
SDF Start of display file.
Hive construction variables.
AS Assembly string in which lines are built up before being added

to hive string.
U\$ Utility string. (general purpose).
TY Type of line to be added e.g., honey cells, empty cells, passageway.
HW Half-width (no, not half-width!), determines slope to sides of hive. Increases with T and N so hive gets wider on successive levels.
K Ladder positions.
G\$ Used in construction of underground section.
T\$
B\$

Main listing.

```
7 IF PEEK 16544<>238 THEN RUN
9000
8 RUN 9995
9 REM -----MAIN LOOP----->
10 LET IP=S-(INKEY$>"W")+ (INKE
Y$="C")+33*((INKEY$="N")-(INKEY$
="J"))
20 IF PEEK IP<134 THEN GOTO
(70)+(30 AND PEEK IP=23)+(130 AN
D PEEK IP=8)
30 POKE S,PEEK 16508
40 POKE 16508,PEEK IP
50 POKE IP,61
60 LET S=IP
70 GOTO USR 16546
100 REM -----PICK-UP-HONEY----->
110 POKE S,PEEK 16508
120 POKE IP,189
130 POKE 16508,137+(11 AND RND<
0.4)
140 GOTO USR 16749
200 REM -----FALL-OFF-LOOP----->
210 POKE S,PEEK 16508
220 LET MC=USR 16546
230 POKE 16508,PEEK IP
240 POKE IP,59
250 LET S=IP
260 LET IP=IP+33
270 IF PEEK IP<10 THEN GOTO 210
280 GOTO 20
300 REM -----CLEARED-SCREEN----->
310 LET U$="CLEARED,BONUS="+STR
$(DK*4)+" PRESS ""P"" WHEN REA
DY FOR NEXT DECK >>>>>>"
320 FOR N=1 TO 64 STEP 3
330 PRINT AT 7,0;(U$( TO N)+E$+
E$) ( TO 64)
340 IF INKEY$<>"P" THEN NEXT N
350 IF N>61 THEN GOTO 300
360 FOR B=1 TO DK+DK
370 LET MC=USR 16749
380 NEXT B
400 REM -----NEXT-DECK----->
410 IF DK>60 THEN GOSUB 4000
420 FOR N=DK TO DK+7+RND*4
430 PRINT AT 0,0;H$( N*32+1 TO
```

```
) ( TO 704)
440 NEXT N
450 LET DK=N-1
460 PRINT AT 22,0;"",TAB 5;{"0"
AND DK<10};DK
470 FOR T=SDF+2 TO SDF+31
480 IF PEEK T>8 THEN POKE T,173
490 POKE SDF+743,61+RND
500 NEXT T
510 POKE 16417,4+DK/2+(16-DK/2
AND DK>32)
520 LET MC=USR 16514
530 LET S=SDF+743
540 POKE 16508,152
550 GOTO 10
600 REM -----MAN-HIT/END----->
610 FOR N=1 TO 12
620 POKE S,CODE ".X*.X*.X*." (
N)
630 PRINT AT 23,22+ABS (N-6.5)
;"BEEHIVE STRING"(N)
640 NEXT N
650 LET STGS=STGS+1
660 PRINT AT 23,31-(STGS>9);STG
S
670 IF STGS<30 THEN GOTO 530
680 PRINT AT 1,0;E$+E$+(E$ AND
RND>.7);AT 1,7;"*---GAMEOVER---
*";AT 3,3;"PRESS ""P"" TO PLAY
AGAIN *">>>"
690 IF INKEY$<>"P" THEN GOTO
680
700 REM -----SET-UP----->
710 FAST
720 LET S=0
730 LET IP=0
740 LET U$=""
750 RAND
760 LET H$=CHR$ 8
770 FOR N=1 TO 8
780 LET H$=H$+H$
790 NEXT N
800 FOR T=0 TO 3
810 FOR N=2+(5 AND T>0) TO 21 5
```

(listing continued on next page)

(continued from previous page)

Please double-check the following lines:

- 870 Inside grey (key H)
- 940 Outside grey (key A)
- 950 Outside grey (key A)
- 9999 Outside grey (key A)
- 630 inverse word 'strings' (backwards!)
- 830 various combinations of graphic shift G and inverse spaces; "is, 2gg, 2is, gg, 3is, 4gg, 2is, 2gg, 3is, 3gg, 2is, gg, 2is"
- 890 inverse H's
- 950 'Outside' grey and inverse H

Check figure is sum of hex data plus 20 x line number.

HEX-DUMP										CHECK
2A	0C	40	11	E5	FF	19	EB	899		
2B	0D	41	06	14	36	00	23	404		
2C	0E	01	23	36	08	23	23	317		
2D	0F	23	72	23	13	10	EE	C9	853	
2E	10	0C	40	01	D6	02	3E	17	520	
2F	11	01	2C	01	0A	FD	7F	1151		
30	12	21	97	41	11	3C	40	01	564	
31	07	00	F5	C5	E5	D5	ED	B0	1464	
32	08	0B	40	E1	D1	C1	F1	ED	1773	
33	09	0C	40	E1	D1	C1	F1	ED		
34	0A	0D	40	E1	D1	C1	F1	ED		
35	0B	0E	40	E1	D1	C1	F1	ED		
36	0C	0F	40	E1	D1	C1	F1	ED		
37	0D	10	40	E1	D1	C1	F1	ED		
38	0E	11	40	E1	D1	C1	F1	ED		
39	0F	12	40	E1	D1	C1	F1	ED		
3A	10	13	40	E1	D1	C1	F1	ED		
3B	11	14	40	E1	D1	C1	F1	ED		
3C	12	15	40	E1	D1	C1	F1	ED		
3D	13	16	40	E1	D1	C1	F1	ED		
3E	14	17	40	E1	D1	C1	F1	ED		
3F	15	18	40	E1	D1	C1	F1	ED		
40	16	19	40	E1	D1	C1	F1	ED		
41	17	1A	40	E1	D1	C1	F1	ED		
42	18	1B	40	E1	D1	C1	F1	ED		
43	19	1C	40	E1	D1	C1	F1	ED		
44	1A	1D	40	E1	D1	C1	F1	ED		
45	1B	1E	40	E1	D1	C1	F1	ED		
46	1C	1F	40	E1	D1	C1	F1	ED		
47	1D	20	40	E1	D1	C1	F1	ED		
48	1E	21	40	E1	D1	C1	F1	ED		
49	1F	22	40	E1	D1	C1	F1	ED		
4A	20	23	40	E1	D1	C1	F1	ED		
4B	21	24	40	E1	D1	C1	F1	ED		
4C	22	25	40	E1	D1	C1	F1	ED		
4D	23	26	40	E1	D1	C1	F1	ED		
4E	24	27	40	E1	D1	C1	F1	ED		
4F	25	28	40	E1	D1	C1	F1	ED		
50	26	29	40	E1	D1	C1	F1	ED		
51	27	2A	40	E1	D1	C1	F1	ED		
52	28	2B	40	E1	D1	C1	F1	ED		
53	29	2C	40	E1	D1	C1	F1	ED		
54	2A	2D	40	E1	D1	C1	F1	ED		
55	2B	2E	40	E1	D1	C1	F1	ED		
56	2C	2F	40	E1	D1	C1	F1	ED		
57	2D	30	40	E1	D1	C1	F1	ED		
58	2E	31	40	E1	D1	C1	F1	ED		
59	2F	32	40	E1	D1	C1	F1	ED		
5A	30	33	40	E1	D1	C1	F1	ED		
5B	31	34	40	E1	D1	C1	F1	ED		
5C	32	35	40	E1	D1	C1	F1	ED		
5D	33	36	40	E1	D1	C1	F1	ED		
5E	34	37	40	E1	D1	C1	F1	ED		
5F	35	38	40	E1	D1	C1	F1	ED		
60	36	39	40	E1	D1	C1	F1	ED		
61	37	3A	40	E1	D1	C1	F1	ED		
62	38	3B	40	E1	D1	C1	F1	ED		
63	39	3C	40	E1	D1	C1	F1	ED		
64	3A	3D	40	E1	D1	C1	F1	ED		
65	3B	3E	40	E1	D1	C1	F1	ED		
66	3C	3F	40	E1	D1	C1	F1	ED		
67	3D	40	40	E1	D1	C1	F1	ED		
68	3E	41	40	E1	D1	C1	F1	ED		
69	3F	42	40	E1	D1	C1	F1	ED		
6A	40	43	40	E1	D1	C1	F1	ED		
6B	41	44	40	E1	D1	C1	F1	ED		
6C	42	45	40	E1	D1	C1	F1	ED		
6D	43	46	40	E1	D1	C1	F1	ED		
6E	44	47	40	E1	D1	C1	F1	ED		
6F	45	48	40	E1	D1	C1	F1	ED		
70	46	49	40	E1	D1	C1	F1	ED		
71	47	4A	40	E1	D1	C1	F1	ED		
72	48	4B	40	E1	D1	C1	F1	ED		
73	49	4C	40	E1	D1	C1	F1	ED		
74	4A	4D	40	E1	D1	C1	F1	ED		
75	4B	4E	40	E1	D1	C1	F1	ED		
76	4C	4F	40	E1	D1	C1	F1	ED		
77	4D	50	40	E1	D1	C1	F1	ED		
78	4E	51	40	E1	D1	C1	F1	ED		
79	4F	52	40	E1	D1	C1	F1	ED		
7A	50	53	40	E1	D1	C1	F1	ED		
7B	51	54	40	E1	D1	C1	F1	ED		
7C	52	55	40	E1	D1	C1	F1	ED		
7D	53	56	40	E1	D1	C1	F1	ED		
7E	54	57	40	E1	D1	C1	F1	ED		
7F	55	58	40	E1	D1	C1	F1	ED		
80	56	59	40	E1	D1	C1	F1	ED		
81	57	5A	40	E1	D1	C1	F1	ED		
82	58	5B	40	E1	D1	C1	F1	ED		
83	59	5C	40	E1	D1	C1	F1	ED		
84	5A	5D	40	E1	D1	C1	F1	ED		
85	5B	5E	40	E1	D1	C1	F1	ED		
86	5C	5F	40	E1	D1	C1	F1	ED		
87	5D	60	40	E1	D1	C1	F1	ED		
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89	5F	62	40	E1	D1	C1	F1	ED		
8A	60	63	40	E1	D1	C1	F1	ED		
8B	61	64	40	E1	D1	C1	F1	ED		
8C	62	65	40	E1	D1	C1	F1	ED		
8D	63	66	40	E1	D1	C1	F1	ED		
8E	64	67	40	E1	D1	C1	F1	ED		
8F	65	68	40	E1	D1	C1	F1	ED		
90	66	69	40	E1	D1	C1	F1	ED		
91	67	6A	40	E1	D1	C1	F1	ED		
92	68	6B	40	E1	D1	C1	F1	ED		
93	69	6C	40	E1	D1	C1	F1	ED		
94	6A	6D	40	E1	D1	C1	F1	ED		
95	6B	6E	40	E1	D1	C1	F1	ED		
96	6C	6F	40	E1	D1	C1	F1	ED		
97	6D	70	40	E1	D1	C1	F1	ED		
98	6E	71	40	E1	D1	C1	F1	ED		
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9E	74	77	40	E1	D1	C1	F1	ED		
9F	75	78	40	E1	D1	C1	F1	ED		
900	76	79	40	E1	D1	C1	F1	ED		
901	77	7A	40	E1	D1	C1	F1	ED		
902	78	7B	40	E1	D1	C1	F1	ED		
903	79	7C	40	E1	D1	C1	F1	ED		
904	7A	7D	40	E1	D1	C1	F1	ED		
905	7B	7E	40	E1	D1	C1	F1	ED		
906	7C	7F	40	E1	D1	C1	F1	ED		
907	7D	80	40	E1	D1	C1	F1	ED		
908	7E	81	40	E1	D1	C1	F1	ED		
909	7F	82	40	E1	D1	C1	F1	ED		
910	80	83	40	E1	D1	C1	F1	ED		
911	81	84	40	E1	D1	C1	F1	ED		
912	82	85	40	E1	D1	C1	F1	ED		
913	83	86	40	E1	D1	C1	F1	ED		
914	84	87	40	E1	D1	C1	F1	ED		
915	85	88	40	E1	D1	C1	F1	ED		
916	86	89	40	E1	D1	C1	F1	ED		
917	87	8A	40	E1	D1	C1	F1	ED		
918	88	8B	40	E1	D1	C1	F1	ED		
919	89	8C	40	E1	D1	C1	F1	ED		
920	8A	8D	40	E1	D1	C1	F1	ED		
921	8B	8E	40	E1	D1	C1	F1	ED		
922	8C	8F	40	E1	D1	C1	F1	ED		
923	8D	90	40	E1	D1	C1	F1	ED		
924	8E	91	40	E1	D1	C1	F1	ED		
925	8F	92	40	E1	D1	C1	F1	ED		
926	90	93	40	E1	D1	C1	F1	ED		
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931	95	98	40	E1	D1	C1	F1	ED		
932	96	99	40	E1	D1	C1	F1	ED		
933	97	9A	40	E1	D1	C1	F1	ED		
934	98	9B	40	E1	D1	C1	F1	ED		
935	99	9C	40	E1	D1	C1	F1	ED		
936	9A	9D	40	E1	D1	C1	F1	ED		
937	9B	9E	40	E1	D1	C1	F1	ED		
938	9C	9F	40	E1	D1	C1	F1	ED		
939	9D	90	40	E1	D1	C1	F1	ED		
940	9E	91	40	E1	D1	C1	F1	ED		
941	9F	92	40	E1	D1	C1	F1	ED		
942	90	93	40	E1	D1	C1	F1	ED		
943	91	94	40	E1	D1	C1	F1	ED		
944	92	95	40	E1	D1	C1	F1	ED		
945	93	96	40	E1	D1	C1	F1	ED		
946	94	97	40	E1	D1	C1	F1	ED		
947	95	98	40	E1	D1	C1	F1	ED		
948	96	99	40	E1	D1	C1	F1	ED		
949	97	9A	40	E1	D1	C1	F1	ED		
950	98	9B	40	E1	D1	C1	F1	ED		
951	99	9C	40	E1	D1	C1	F1	ED		
952	9A	9D	40	E1	D1	C1	F1	ED		
953	9B	9E	40	E1	D1	C1	F1	ED		
954	9C	9F	40	E1	D1	C1	F1	ED		
955	9D	90	40	E1	D1	C1	F1	ED		
956	9E	91	40	E1	D1	C1	F1	ED		
957	9F	92	40	E1	D1	C1	F1	ED		
958	90	93	40	E1	D1	C1	F1	ED		
959	91	94	40	E1	D1	C1	F1	ED		
960	92	95	40	E1	D1	C1	F1	ED		
961	93	96	40	E1	D1	C1	F1	ED		
962	94	97	40	E1	D1	C1	F1	ED		
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WORLD QUIZ ATARI

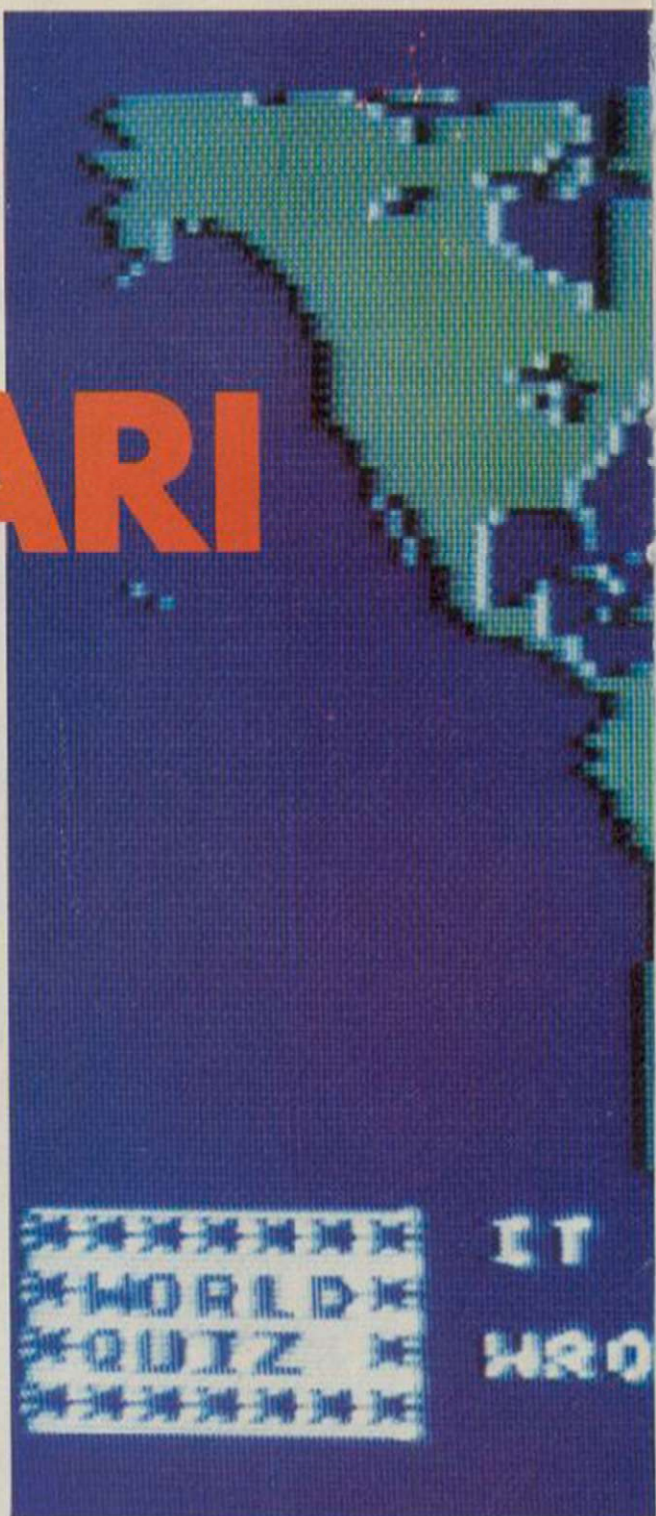
THIS PROGRAM, FOR any Atari, plots a map of the world in green on a blue background. A particular country, continent or other feature is then highlighted and you are asked to choose from four alternative answers. Press 1 to 4 as appropriate — ensure that you are not in lower case or inverse video otherwise and answers will be ignored.

Your answers will be marked correct/wrong and the highlighted area will be returned to its original colour. After 10 questions your score will be displayed and pressing Start will cause another 10 questions to be presented. The variables used in the program are:

X, Y, L — The map is plotted as a series of horizontal lines. X, Y are the start co-ordinates and L is the line length.
I — Loop variable.
R — Random question line number.
Q — Array of already asked questions to prevent repeats.
SP1\$, SP2\$ — Empty strings used for blanking other strings or text areas.
T — Total questions asked in round.
S — Score in round.
A1\$-A4\$ — Four alternative answers.
A — Correct answer.

K — Keyboard response.
The program is structured as follows:

Line	Function
1-10	Title plus skip over sub-routines.
100-120	Subroutine to plot selected.
200-240	Subroutine to randomly select question and check not asked this round.
300	Subroutine to clear centre and right text areas of screen.
400	Subroutine to clear centre text area of screen.
1000-1110	Initial run processing — plots world, prints title, dimensions arrays, opens keyboard.
1150-1160	Initial round processing — sets score, turn, question array to zero.
1200-1520	Turn processing — selects question, restores appropriate data statement, reads and prints question, plots selected area, accepts and checks answer, restores question data again and replots area in original colour.
1800-1890	End of round processing — prints score after 10 questions and waits for start key to be pressed.
4100-10000	Data statements.



```

1 REM *****
2 REM ***** WORLD QUIZ *****
3 REM ***** H.P.LORD *****
4 REM ***** MAR 1984 *****
5 REM *****
10 GOTO 1000
100 READ Y:IF Y=-1 THEN RETURN
110 READ X:READ L
120 PLOT X,Y:DRAWTO X+L-1,Y:GOTO 100
200 R=INT(RND(0)*28)+1:GO+4100
210 I=0
220 I=I+1:IF R=Q(I) THEN 200
230 IF Q(I)<0 THEN 220
240 Q(I)=R:RETURN
300 FOR I=0 TO 3:POKE 656,I:POKE 657,R:PRINT SP1$:
SP2$:NEXT I:RETURN
400 FOR I=0 TO 3:POKE 656,I:POKE 657,B:PRINT SP1$:
:NEXT I:RETURN
1000 GRAPHICS 7:POKE 752,1:POKE 712,128:POKE 708,1
66:POKE 709,26:POKE 710,128
1010 DIM A$(20),A2$(20),A3$(20),A4$(20),SP1$(8),S
P2$(23),Q(10)
1020 SP2$="" *:SP1$=SP2$
1040 OPEN #1,4,0,"K:"
1050 POKE 656,0:POKE 657,0: "*****"
1060 POKE 656,1:POKE 657,0: "WORLD:"
1070 POKE 656,2:POKE 657,0: "QUIZ:"
1080 POKE 656,3:POKE 657,0: "*****"
1100 RESTORE 5100:COLOR 1
1110 READ A$:IF A$<"****" THEN READ A2$:READ A3$
:READ A4$:READ A:GOSUB 100:GOTO 1110
1150 T=0:S=0
1160 FOR I=1 TO 10:Q(I)=0:NEXT I
1200 GOSUB 300:T=T+1:IF T>10 THEN GOTO 1800
1210 A1$=SP2$:A2$=SP2$:A3$=SP2$:A4$=SP2$
1300 GOSUB 200:RESTORE R:READ A1$:READ A2$:READ A3$
:READ A4$:READ A:COLOR 2:GOSUB 100
1310 POKE 656,0:POKE 657,B: " IS THIS 1."A1$:
1320 POKE 656,1:POKE 657,B: " OR 2."A2$:
1330 POKE 656,2:POKE 657,B: " OR 3."A3$:
1340 POKE 656,3:POKE 657,B: " OR 4."A4$:
1350 GET #1,K:IF K<49 OR K>52 THEN GOTO 1350
1360 K=K-48:GOSUB 400

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1370 POKE 656,K-1:POKE 657,B
1380 IF K=A THEN "CORRECT":S=S+1:GOTO 1500
1390 "WRONG=>"
1400 POKE 656,A-1:POKE 657,B
1410 "IT IS=>"
1500 FOR I=1 TO 1500:NEXT I
1510 RESTORE R:READ A1$:READ A2$:READ A3$:READ A4$
:READ A:COLOR 1:GOSUB 100
1520 GOTO 1200
1800 POKE 656,0:POKE 657,10: "YOU SCORED "S" OU
T OF 10:"
1810 A1$="TERRIBLE"
1820 IF S>1 THEN A1$="NOT SO GOOD"
1830 IF S>4 THEN A1$="NOT TOO BAD"
1840 IF S>7 THEN A1$="VERY GOOD"
1850 IF S>9 THEN A1$="EXCELLENT"
1860 POKE 656,1:POKE 657,12: "THAT'S "A1$:
1870 POKE 656,3:POKE 657,B: "PRESS START FOR ANOT
HER TURN:"
1880 IF PEEK(53279)=6 THEN GOTO 1150
1890 GOTO 1800
4100 DATA ANDES,ROCKY,HIMALAYAN,ATLAS MTS,4
4110 DATA 28,69,4,29,68,3,30,68,2,31,67,2,-1
4200 DATA ANDES,ROCKY,HIMALAYAN,ATLAS MTS,3
4210 DATA 27,102,5,28,103,5,29,104,5,30,106,5,31,1
07,5,-1
4300 DATA SAHARA,KALAHARI,GIBSON&SIMPSON,GOBI DESE
RT,1
4310 DATA 32,71,12,33,70,14,34,69,16,35,68,18,36,6
8,18,37,69,16,38,70,14,-1
4400 DATA SAHARA,KALAHARI,GIBSON&SIMPSON,GOBI DESE
RT,2
4410 DATA 57,77,4,58,78,4,59,78,3,60,78,2,-1
4500 DATA SAHARA,KALAHARI,GIBSON&SIMPSON,GOBI DESE
RT,3
4510 DATA 57,120,8,58,119,10,59,119,10,60,120,8,-1
4600 DATA CHILE,ARGENTINA,PERU,BRAZIL,1
4610 DATA 55,44,2,56,44,2,57,44,2,58,44,2,59,44,2,
60,44,2,61,44,2,62,43,2,63,43,2,64,43,2,65,43,2,
4615 DATA 66,43,2,67,43,2,68,43,2,69,43,2,70,43,2,
71,43,2,72,43,2,73,43,2,74,43,2,75,43,2
4620 DATA 76,43,2,77,44,1,78,45,1,-1
4700 DATA CHILE,ARGENTINA,PERU,BRAZIL,2

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4710 DATA 57,45,2,58,45,3,59,45,4,60,45,6,61,45,5,
62,44,5,63,44,4,64,44,4,65,44,4,66,44,3,67,44,3
4715 DATA 68,44,3,69,44,3,70,44,3,71,44,2,72,44,2,
73,44,3,74,44,2,75,44,1,76,44,1,77,45,1,78,46,1,-1
4800 DATA CHILE,ARGENTINA,PERU,BRAZIL,4
4810 DATA 43,46,2,44,46,2,45,51,1,45,44,4,45,49,3,
46,44,10,47,44,12,48,42,16,49,42,16,50,43,15
4815 DATA 51,46,11,52,47,10,53,48,9,54,49,8,55,49,
7,56,49,7,57,50,5,58,50,4,59,50,3,60,49,4
4820 DATA 61,49,4,62,50,2,-1
4900 DATA SCANDINAVIA,RUSSIA,ICELAND,HOLLAND,1
4910 DATA 0,80,4,1,79,5,2,78,5,3,78,6,4,77,7,5,77,
4,5,83,1,6,76,5,6,82,2,7,75,6,7,82,2
4915 DATA 8,74,5,8,81,4,9,74,6,10,74,5,11,74,2,11,
77,2,12,77,2,13,77,1,-1
5000 DATA CANARY ISLANDS,JAPAN,BRITISH ISLES,ENGLA
ND,3
5010 DATA 11,70,1,12,70,2,13,68,1,13,70,2,14,67,2,
14,71,2,15,67,2,15,73,3,16,69,3,-1
5100 DATA NEW ZEALAND,AUSTRALIA,JAPAN,MADAGASCAR,2
5110 DATA 52,124,3,52,129,1,53,124,3,53,129,1
5115 DATA 54,122,4,54,128,3,55,121,10,56,118,14
5120 DATA 57,117,15,58,117,16,59,118,15,60,118,16
5125 DATA 61,118,16,62,118,16,63,118,5,63,126,7
5130 DATA 64,117,3,64,126,7,65,128,4,66,128,4
5135 DATA 67,129,2,69,130,2,70,131,1,-1
5200 DATA NEW ZEALAND,AUSTRALIA,JAPAN,MADAGASCAR,1
5210 DATA 64,141,1,65,142,1,66,142,2,67,141,2
5215 DATA 68,140,1,68,142,1,69,140,1,70,139,2
5220 DATA 71,138,2,72,138,1,-1
5300 DATA BRAZIL,CENTRAL AMERICA,CHILE,SOUTH AMERI
CA,4
5310 DATA 41,42,3,42,41,7,43,41,8,44,41,11,45,40,1
2,46,39,15
5315 DATA 47,40,16,48,39,19,49,40,18,50,41,17,51,4
1,16,52,42,15
5320 DATA 53,42,15,54,43,14,55,44,12,56,44,12,57,4
4,11,58,44,10
5325 DATA 59,44,9,60,44,9,61,44,9,62,43,9,63,43,8,
64,43,7
5330 DATA 65,43,6,66,43,6,67,43,6,68,43,5,69,43,4,
70,43,4
5335 DATA 71,43,3,72,43,3,73,43,4,74,43,3,75,43,2,

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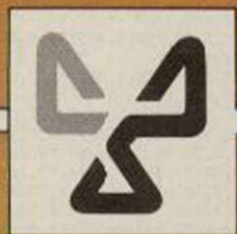
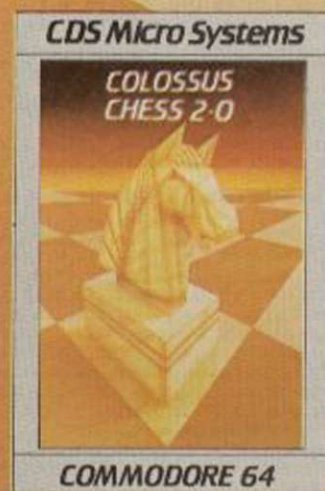
IS => 1. SAHARA
2. KALAHARI
NG => 3. GIBSON DESERT
4. GOBI DESERT

76,43,2
5340 DATA 77,44,2,78,45,2,-1
5400 DATA U.S.A.,MEXICO+CENT.AMERICA,FLORIDA,CUBA,2
5410 DATA 28,25,2,29,25,1,29,27,3,30,26,1,30,28,3,
31,26,1,31,28,4,32,27,1,32,29,4
5415 DATA 33,27,1,33,29,4,34,30,3,35,30,3,35,36,1,
36,30,3,36,35,2
5420 DATA 37,31,6,38,32,5,39,35,4,40,37,2,41,38,2,
42,39,2,-1
5500 DATA WEST INDIES,EAST INDIES,CANARY ISLES,BAL
EARIC ISLES,1
5510 DATA 33,42,1,34,38,3,34,44,1,35,40,2,36,43,2
5515 DATA 37,40,1,37,42,3,37,46,1,38,47,1,39,49,1,
40,47,1,-1
5600 DATA CANADA,MEXICO,U.S.A.,ALASKA,3
5610 DATA 0,7,9,1,6,10,2,7,9,3,8,8,4,5,11,5,6,10,6
8,8,7,7,9,8,6,10,9,7,4,9,12,1,9,14,2
5615 DATA 10,7,4,10,16,1,11,9,2,11,17,1,12,8,1,12,
18,1,13,7,1,13,19,1,35,8,1,36,10,1
5620 DATA 19,22,12,20,22,13,21,22,16,21,45,1,22,22
14,22,37,1,22,41,3,23,22,16,23,39,4,24,23,19
5625 DATA 25,24,18,26,24,17,27,25,15,28,27,12,29,3
0,9,30,31,3,30,38,2,31,32,1,31,39,1,32,39,1,-1
5700 DATA CANADA,MEXICO,U.S.A.,ALASKA,1
5710 DATA 0,16,1,0,19,5,0,26,5,0,42,3,1,16,10,1,33
6,1,42,3,2,16,12,2,29,11,2,42,4,3,16,12,3,29,11
5715 DATA 3,42,6,4,16,22,4,42,6,5,16,21,5,38,2,5,4
1,5,6,16,17,6,37,3,6,43,3,7,16,11,7,29,6,7,33,2
5720 DATA 7,37,2,8,16,10,8,28,6,8,41,4,9,16,18,9,4
1,4,10,17,17,10,41,4,10,46,1,11,18,17,11,41,6
5725 DATA 12,19,17,12,41,7,13,20,18,13,41,8,14,20,
20,14,41,9,15,20,20,15,41,9,16,21,20,16,41,7
5730 DATA 17,21,26,17,49,1,18,22,24,18,49,1,19,34,
3,19,38,7,19,48,3,20,38,8,20,48,3
5735 DATA 21,40,4,21,46,2,22,39,2,-1
5800 DATA CANADA,GREENLAND,NORWAY,ICELAND,2
5810 DATA 0,51,11,1,52,9,2,52,8,3,51,7,4,51,5,5,51
5,6,51,4,7,52,3,8,52,3,9,54,1,-1
5900 DATA CANADA,GREENLAND,NORWAY,ICELAND,4
5910 DATA 4,62,1,4,66,1,5,62,5,6,62,4,7,63,2,-1
6000 DATA JAPAN,KOREA,PHILIPPINES,NEW ZEALAND,1
6010 DATA 20,129,1,21,128,3,23,128,1,24,128,1,25,1

27,2,26,125,3,27,124,3,28,124,1,-1
6100 DATA MADAGASCAR,CANARY ISLES,JAPAN,PHILIPPINE
S,1
6110 DATA 52,91,1,53,90,2,54,89,3,55,89,3,56,89,2,
57,89,2,58,90,1,-1
6200 DATA EGYPT,SOUTH AMERICA,MADAGASCAR,AFRICA,4
6210 DATA 26,73,3,27,69,1,27,71,5,28,68,7,29,67,10
29,80,1,30,67,11,30,80,5,31,67,18
6215 DATA 32,66,20,33,65,21,34,65,22,35,65,22,36,6
6,22,37,66,22,38,65,23,39,65,24
6220 DATA 40,66,23,40,91,1,41,66,26,42,67,24,43,68
4,43,74,16,44,76,14,45,76,13,46,76,9,46,86,2
6225 DATA 47,77,11,48,77,11,49,77,11,50,78,11,51,7
7,12,52,77,11,53,76,11,54,76,10,55,77,8
6230 DATA 56,77,8,57,77,9,58,78,8,59,78,7,60,78,7,
61,79,6,62,79,5,63,79,4,-1
6300 DATA EUROPE,SCANDINAVIA,RUSSIA,FRANCE,1
6310 DATA 11,70,1,12,70,2,13,68,1,13,70,2,14,67,2,
14,71,2,15,67,2,15,70,3,16,69,3
6315 DATA 0,80,4,1,79,5,2,78,5,3,78,6,4,77,7,5,77,
4,5,83,1,6,76,5,6,82,2,7,73,6,7,82,2
6320 DATA 8,74,5,8,81,4,9,74,6,10,74,5,11,74,2,11,
77,2,12,77,2,13,77,1
6325 DATA 13,75,1,14,75,2,15,75,2,16,74,7,17,73,8,
18,70,11,19,70,11,20,71,12,21,71,12
6330 DATA 22,68,5,22,76,2,22,79,5,23,68,5,23,77,2,
23,80,2,23,83,7,24,68,4,24,75,1
6335 DATA 24,78,1,24,80,1,24,83,7,25,68,4,25,78,1,
25,81,1,25,83,7,26,69,2,26,77,1
6340 DATA 27,82,1,27,84,1,-1
6400 DATA EUROPE,SCANDINAVIA,RUSSIA,FRANCE,3
6410 DATA 0,99,37,1,84,1,1,96,2,1,99,45,2,83,4,2,9
6,2,2,99,46,3,83,5,3,89,1,3,91,55
6415 DATA 4,84,1,4,86,2,4,90,57,5,84,2,5,88,61,6,8
4,2,6,88,57,6,146,2,7,84,59,8,85,50,8,137,4
6420 DATA 9,85,1,9,87,47,9,137,2,10,82,52,10,136,2
11,81,47,11,135,3,12,81,46,12,134,4
6425 DATA 13,81,45,13,134,3,14,81,47,14,134,2,15,8
0,48,15,129,1,15,134,2,16,81,39,16,122,6
6430 DATA 16,129,1,16,134,1,17,81,31,17,113,7,17,1
23,5,17,129,1,18,81,26,18,123,4,18,129,1
6435 DATA 19,81,26,19,124,4,20,83,23,20,126,2,21,8
3,1,21,85,1,21,87,4,21,93,3,21,97,8

6440 DATA 21,125,2,22,88,3,22,92,3,22,97,7,22,124,
2,23,89,3,23,94,10,24,94,7,25,96,2,-1
6500 DATA TIBET,CHINA,INDIA,MONGOLIA,4
6510 DATA 17,112,1,18,107,12,19,108,12,20,109,10,2
1,109,9,22,110,7,-1
6600 DATA TIBET,CHINA,INDIA,MONGOLIA,2
6610 DATA 16,120,2,17,120,3,18,119,4,19,107,1,19,1
20,4,20,106,3,20,119,7,21,105,4,21,118,7
6615 DATA 22,104,6,22,117,7,23,104,16,23,121,2,24,
101,18,25,101,20,26,102,18,27,103,17
6620 DATA 28,104,16,29,104,16,30,106,15,31,108,13,
32,110,11,33,111,9,34,112,7,35,115,3,36,116,1,-1
6700 DATA TIBET,CHINA,INDIA,MONGOLIA,3
6710 DATA 29,102,3,30,101,3,31,101,9,32,100,7,32,1
08,2,33,100,7,33,109,1,34,95,8,35,100,7
6715 DATA 36,101,5,37,101,4,38,102,2,39,102,2,40,1
02,1,-1
6800 DATA WEST INDIES,EAST INDIES,CANARY ISLES,BAL
EARIC ISLES,2
6810 DATA 43,109,1,44,110,1,45,111,2,46,111,2,47,1
12,2,48,112,1
6815 DATA 49,113,3,49,117,1,49,119,1,50,121,1
6820 DATA 43,118,2,44,117,2,45,116,4,46,116,3,47,1
17,2
6825 DATA 37,120,1,38,120,1,39,120,2,41,119,1,41,1
21,1,42,121,2,43,122,1
6830 DATA 45,120,3,45,124,1,46,120,1,46,126,2,47,1
20,2,47,127,1,47,129,1
6835 DATA 48,120,1,48,124,1,48,127,4,49,128,5,50,1
29,2,50,132,1,51,132,2
6840 DATA 48,133,1,49,135,1,50,136,1,51,137,1,-1
9000 DATA OTHERS,X,X,X,1
9010 DATA 32,107,1,33,107,2,34,107,2,23,123,2,24,1
23,1,25,123,2,26,124,1,41,104,1,33,121,1,34,121,1
9015 DATA 24,90,2,25,86,18,26,86,18,27,86,18,28,86
18,29,86,18,30,85,21,31,86,6,31,93,11,32,87,5
9020 DATA 32,96,8,33,87,6,33,94,1,33,97,7,34,88,8,
35,88,7,36,89,5,37,89,4,38,90,2,39,90,1
9025 DATA 31,104,8,32,104,8,33,104,8,34,104,12,35,
109,5,36,110,4,37,111,4,38,111,5
9030 DATA 39,111,1,39,113,3,40,111,1,40,114,2,41,1
11,1,41,114,1,42,111,1,43,112,1,44,113,1,-1
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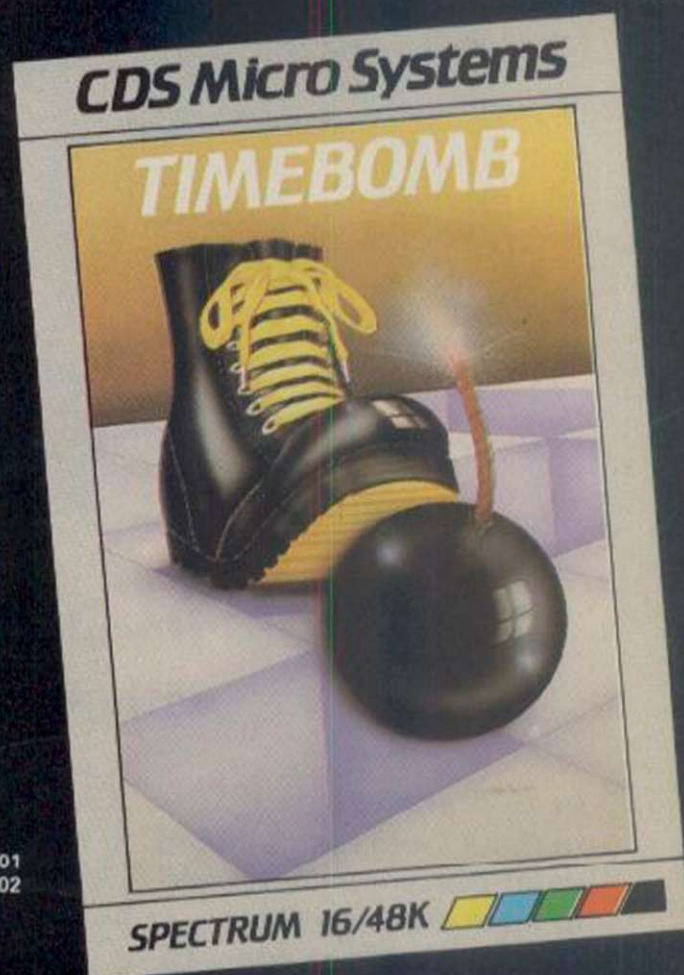
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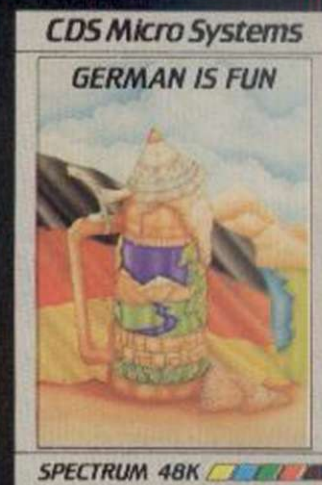
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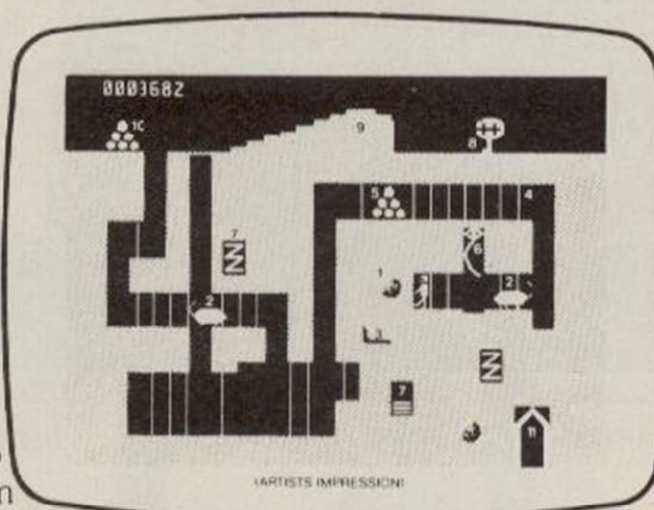
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All the time the Gremlin (8) is busy digging its way through your waste earth pile (9) to reach the entrance to your mine. Once it does you have no



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escape!! – so you must stop it getting there by returning to the surface to replenish the main mound (9) with the smaller pile of earth which appears on the surface as you dig (10). The deeper you dig the more points you score –

but the further you have to go to replenish that mound! Once all nuggets have been collected, a cave opens (11) allowing you to pass through to the next stage – if you can reach it! This gives you more rats – but less snakes to destroy them with!!

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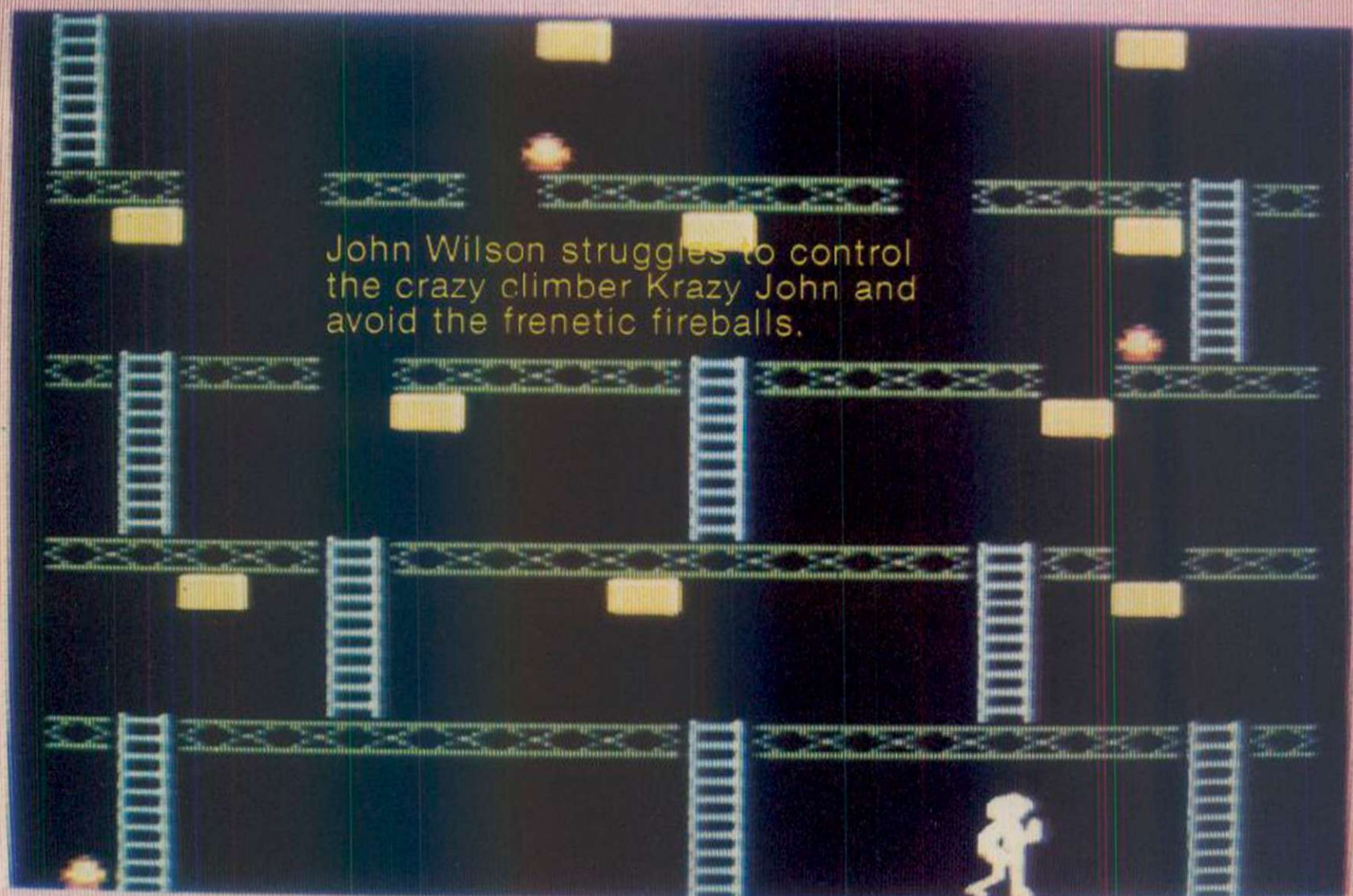
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Score: 0
Time: 4400
Hi score: 0



L=0



KRAZY JOHN

KRAZY JOHN IS A program for the BBC Micro Model B or Model A with 32K. The program makes extensive use of BBC Basic and machine code to give a fast arcade-type game. Before I go into how the program works, I will give a brief description of how to play the game.

You take control of Krazy John, the fool-hardy climber, and must try to climb the high rise building before your time runs out. You must climb up the ladders and run along the girders, jumping the fireballs that spread along the floor, jump the gaps and collect the yellow blocks on your way to the top. In order to collect a block, you must jump up underneath one. Once this has been done, you are awarded some points, and the final elevator is lowered. To complete the screen, you must collect all the yellow blocks, and climb up the final ladder in

(continued on page 115)

```
10REM
20REM   Krazy John
30REM
40REM   by J.R.Wilson
50REM
60ONERRORRUN
70MODE7
80PROC1(3,3,CHR#132+CHR#157+CHR#134+"K R A Z Y "+CHR#156)
90PROC1(17,7,CHR#132+CHR#157+CHR#134+"J O H N "+CHR#156)
100PROC1(8,12,CHR#129+"by"+CHR#130+"J.R.Wilson")
110PROC1(3,18,"Do you want instructions?")
120A$=GET$
130IFA$="Y"THENPROCInstructions:GOTO150
```

```
140IFA$<>"N"THEN120
150ENVELOPE1,5,1,0,0,10,1,1,126,-1,-2,-3,126,120
160CLS
170ENVELOPE2,3,0,0,0,0,0,126,-1,-2,-5,126,80
180VDU23,224,0,0,56,108,60,60,24,152
190VDU23,225,188,172,246,54,54,38,44,60
200VDU23,226,40,40,40,40,36,34,33,98
210VDU23,227,0,0,28,54,60,60,24,25
220VDU23,228,61,53,111,108,108,100,52,60
230VDU23,229,20,20,20,20,36,68,132,70
240VDU23,230,0,0,0,1,135,143,252,15
250VDU23,231,0,0,2,130,231,245,29,247
260VDU23,232,1,2,1,0,65,51,15,3
```

(listing continued on page 115)

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270VDU23,133,192,192,192,128,192,224,32,208
280VDU23,234,3,3,1,3,14,152,112,32
290VDU23,235,236,224,197,224,56,14,4,8
300VDU23,236,3,3,3,1,3,1,4,27
310VDU23,237,128,64,128,0,130,204,240,192
320VDU23,238,35,3,3,7,26,112,32,16
330VDU23,239,192,192,128,224,48,25,14,4
340VDU23,242,0,255,36,66,129,66,36,255
350VDU23,243,66,66,66,66,66,66,66,102
360VDU23,244,60,60,60,60,60,60,60,60
370VDU23,245,128,153,157,189,189,189,153,129
380VDU23,246,66,126,66,66,66,126,66,66
390VDU23,247,0,255,255,255,255,255,255,255
400VDU23,248,0,24,60,60,61,61,25,25
410VDU23,249,61,126,188,188,188,188,188,188
420VDU23,250,36,36,36,36,36,32,32,32
430PROCcode
440CLEAR
450key=2351:poke=2304:IP=2452:YP=2472:D1=2492
460PROC2
470VDU23:8202:0:0:0:0
480SX=0:MX=0:MX=3:CH=02
490PROCscreen
500PROCbarrel:PROCTime:PPOINT(X1+8,Y1X-104)=0ANDPO
INT(X1+25,Y1X-104)=0PROCall
510AX=POINT(X1,Y1X-90):BX=POINT(X1+63,Y1X-90):CX=P
OINT(X1X-8,Y1X-48):DX=POINT(X1+63,Y1X-48):EX=POINT(X1
X,Y1X):FX=POINT(X1X+64,Y1X):GX=POINT(X1,Y1X-16):IX=P
OINT(X1+64,Y1X-16):JX=POINT(X1X+32,Y1X-90)AND6
520IF AX=1ORBX=1ORCX=1ORDX=1OREX=1ORFX=1ORGX=1ORIX=1O
RAX=3ORBX=3ORCX=3ORDX=3ORFX=3ORIX=3ORJX=1O
RJX=3PROCdead
530IF INKEY=74PROCjump:8010500
540CX=0:IF INKEY=98PROCleft:KX=1
550IF INKEY=67PROCright:KX=1
560IF INKEY=105PROCdown:KX=1
570IF INKEY=73PROCup:KX=1
580IFYX=896THENPROCnext_screen
590IFCX=0PROCdelay(10)
600GOTO500
610OFFPROC:VDU24,COLOUR33:COLOUR33=1245:800:ENDPROC
620OFFPROC:score=COLOUR33:COLOUR4:PRINTTAB(7,1):SX:C
LOUR128:ENDPROC
630OFFFPN(X,Y):VDU11,X,Y:AX=135:ZX=(USR&FFF4)AN
D&FFF4:DIV256:1FXZ):27ZX:130R224
640=ZX
650OFFPROCscreen
660VDU24:COLOUR33:CLS
670PROC3:WCOL,0,128:800
680COLDR4:PRINTTAB(1,1):"Score="
690PRINTTAB(1,3):"Time="
700PRINTTAB(1,5):"Hi score=":HX
710FORI=1TOTR
720PRINTTAB(12+I*2,1):
730VDU224,10,8,225,10,8,226
740NEXT
750PRINTTAB(16,5):"L=":WZ
760PROCscore
770COLDR2
780FORI=1TOSTEP5
790PRINTTAB(1,1):STRING(18,CHR$242)
800NEXT
810COLDR6
820FORI=1TOTR
830PRINTTAB(2,25+I):CHR$246
840PRINTTAB(17,25+I):CHR$246
850PRINTTAB(10,25+I):CHR$244
860PRINTTAB(15,25+I):CHR$244
870PRINTTAB(14,20+I):CHR$246
880PRINTTAB(2,15+I):CHR$246
890PRINTTAB(10,15+I):CHR$246
900PRINTTAB(17,10+I):CHR$246
910IFI>1PRINTTAB(1,5+I):CHR$246
920NEXT
930VDU19,15,7,0,0,0
940CX=HEL:1FEX:37HENEK=*
950PRINTTAB(13,11):"
960FORI=1TOEX*2+5
970V=WRND(51)+5+6
980X=WRND(16)+1
990IFFPN(X,Y)<242ORFPN(X-1,Y)<242ORFPN(X+1,Y)<242
THENY70
1000IFFPN(X,Y-1)=246THENY70
1010PRINTTAB(X,Y):"
1020NEXT
1030COLDR8:VDU19,8,3,0,6,0
1040RESTORE1050
1050DATA23,22,16,22,9,22
1060DATA6,17,15,17

```

```

1070DATA2,12,16,12,10,12
1080DATA18,7,8,7
1090FORI=1TO10
1100READX,Y,PRINTTAB(X,Y);CHR(247);
1110NEXT
1120US=224;LZ=10
1130X1=X+512;Y1=Y+128;PROCcan
1140CLX=0
1150FORI=0TOD19;I?Y?0;NEXT
1160FORI=0TOD19
1170IFRND(1)>.15THENI23
1180I?X?RND(16)+10;I?Y?RND(8)+5+5
1190I?I?Y?30AND808(1789-30)/10THEN1180
1200X=X-RND(3)-2;I?DX?0THEN1200
1210I?DI?0
1220I?SO=YP?I?788;XP?I?CALLookup
1230NEXT
1240PROCdelay(100)
1250COLORCLX33;PRINTTAB(LZ+MX+2,1)*"*(CHR(10);CHR(10);
"*(CHR(10);CHR(10);"
1260COLORLZ10
1270I?HE=0
1280ENDPROC
1290PROCdelay(AZ);AZ=I?HE+AZ;REPEATUNTILTIME>AZ;EN
DPROC
1300EFP?PROCcan;BCDL3,7;MOVEX1X,Y1X;VDUS,UX;MOVEX1X,Y1
X-32;VDUS+1;MOVEX1X,Y1X-64;VDUS+2,4;ENDEFP?PROC
1310EFP?PROCleft;IFCLXORX1X=32ENDEFP?PROC
1320PROCcan;IFUX>224UX=224;PROCcan;ENDEFP?PROC
1330I1X=X1X-32;PROCcan;ENDEFP?PROC
1340EFP?PROCright;IFCLXORX1X=1184ENDEFP?PROC
1350PROCcan;IFUX>227UX=227;PROCcan;ENDEFP?PROC
1360I1X=X1X-32;PROCcan;ENDEFP?PROC
1370EFP?PROCup;IFPOINT(X1X+8,Y1X-96)<6ANDNOTCLXENDP?PROC
1380CLX=TRUE;IFPOINT(X1X+8,Y1X-80)<64CLX=0
1390?FPOINT(X1X+32,Y1X+8)=1PROCdelay
1400PROCcan;Y1Y=Y1X+16;UX=248;PROCcan
1410EFP?PROCdown;IFPOINT(X1X+8,Y1X-100)<6ANDNOTCLXENDP?PROC
1420CLX=TRUE;IFPOINT(X1X+8,Y1X-100)<64CLX=0;ENDEFP?PROC
1430PROCcan;Y1Y=Y1X-16;UX=248;PROCcan;ENDEFP?PROC
1440EFP?PROC;UC=UC;XCH040000000000000011,1,0,0,5,3FIN
K;X1X=32PROCjump_left;ENDEFP?PROC.ELSEIFINKEY=87AND
X1X=1184PROCjump_right;ENDEFP?PROC
1450PROCcan;X1X=X1X-32;IFRND(Y1YTOY1X+32)EFP?PROC
1460IFPOINT(X1X+64,Y1X+4)=80RPOINT(X1X+32,Y1X+4)=80PROC
1470IFUX=224PROCcanJUL.ELSEPROCcanJR
1480IFRCDarr=IFUX=224PROCcanJUL.ELSEPROCcanJR
1490NEXTIFRDX1X=Y1XTOY1X-32STEP-B
1500IFUX=224PROCcanJUL.ELSEPROCcanJR
1510IFRCDarr=IFUX=224PROCcanJUL.ELSEPROCcanJR
1520NEXT
1530I1X=X1X+32;PROCcan;ENDEFP?PROC
1540EFP?PROCjump_left;PROCcan;UX=224;FORI1X=Y1XTOY1X+3
2STEP-E
1550?FPOINT(X1X+64,Y1X+4)=80RPOINT(X1X+32,Y1X+4)=80PROC
1560I1X=X1X+16;PROCcanJUL;PROCcanJUL;PROCcanJUL;NEXT
1570FORIY1X=Y1XTOY1X-32STEP-B;IFPOINT(X1X+64,Y1X+4)=80
RPOINT(X1X+32,Y1X+4)=80PROCChit
1580I1X=X1X-B;PROCcanJUL;PROCcanJUL;PROCcanJUL;NEXT;X1X
=Y1X-B;PROCcan;ENDEFP?PROC
1590EFP?PROCcanJUL;BCDL3,7;MOVEX1X,Y1X;VDUS,232,233;MOV
EX1X,Y1X-32;VDUS234,235,4;ENDEFP?PROC
1600EFP?PROCcanJUL;BCDL3,7;MOVEX1X,Y1X;VDUS,236,237;MOV
EX1X,Y1X-32;VDUS238,239,4;ENDEFP?PROC
1610EFP?PROCjump_right;PROCcan;UX=227;FORIY1X=Y1XTOY1X+
32STEP-E
1620?FPOINT(X1X+64,Y1X+4)=80RPOINT(X1X+32,Y1X+4)=80PROC
1630I1X=X1X+B;PROCcanJR;PROCcanJR;PROCcanJR;NEXT
1640FORIY1X=Y1XTOY1X-32STEP-B;IFPOINT(X1X+64,Y1X+4)=80
RPOINT(X1X+32,Y1X+4)=80PROCChit
1650I1X=X1X+B;PROCcanJR;PROCcanJR;PROCcanJR;NEXT;X1X
=Y1X+B;PROCcan;ENDEFP?PROC
1660I1X=X1X+16;PROCcanJUL;BCDL3,7;MOVEX1X,Y1X;VDUS,232,233;MOV
EX1X,Y1X-32;VDUS234,235,4;ENDEFP?PROC
1670I1X=X1X+16;PROCcanJUL;BCDL3,7;MOVEX1X,Y1X;VDUS,236,237;MOV
EX1X,Y1X-32;VDUS238,239,4;ENDEFP?PROC
1680I1X=X1X+16;PROCcanJUL;BCDL3,7;MOVEX1X,Y1X;VDUS,232,233;MOV
EX1X,Y1X-32;VDUS234,235,4;ENDEFP?PROC
1690I1X=X1X+16;PROCcanJUL;BCDL3,7;MOVEX1X,Y1X;VDUS,236,237;MOV
EX1X,Y1X-32;VDUS238,239,4;ENDEFP?PROC
1700PROCcan;PROCcan;VX=VX+1;UNTILPOINT(X1X+8,Y1X-104)<0
ORPOINT(X1X+55,Y1X-104)<0
1710PROCcan;PROCdelay;ENDEFP?PROC
1720EFP?PROCChit;SOUND(13,2,20,S,LX=LX+1;X=X+X1DIV64;YX
=32-Y1DIV32
1730I?X?0;Y2=Y2+0
1740IFPH(X2,Y2-1)=247THENX2X=2;Y2=Y2-1;16TOD1770
1750IFPH(X2,Y2-1)=247THENX2X=1;Y2=Y2-1;16TOD1770
1760IFPH(X2,Y2-1)=247THENY2Y=2;16TOD1770

```

```

1760G=PROC
1770X=X3+X2:Y=Y3+Y2:COL=C,0:MOVEX+64,(32-Y):*32-4
1780Y=Y2+4
1790IFX=100:PROCACR
1790COL=0,0:MOVE230,1090-13*20:VDUS,242:GC00,0:MOVE30,1070-13*20:VDU242,4:GC0L,15:MOVE242,1100:DRM4242,1
1800-L*20:MOVE254,1100:DRM254,1070-13*20:ENDPROC
1800DEFPROCACR_screen:SCREEN:1045,2,10,5:MX=MX+1:CH=CH+0
20FORI=TX*100:FORTE=100:COLUR(33):COLUR(33):PRINTTAB(7,3)
1) "13X=BX+100:PROCACR:BOUNDS12,20,10,3:PROCDel
ay(20):NEXTI:PROCACR:ENDPROC
1810DEFPROCACR:TX=5000-1:IFD DIV3000=100:COLUR(33):C
OLUR(4):PRINTTAB(7,3):TX="COLUR(28):IFTX=OPPROCDead
1820ENDPROC
1830DEFPROCCL(X,Y,A):PRINTTAB(X,Y):CHR(141):A:TA
B(X,Y,1):CHR(141):A:ENDPROC
1840DEFPROCDead:PROCACR
1850FORI=1:TO8
1860GCOL=10,17,2,2:Uz=224:PROCACR:PROCACR
1870BOUNDS=10,17,3,2:Uz=227:PROCACR:PROCACR
1880END
1890MDCOL=X,Y,112-6:GC0L,3:VDUS,250,251,4:BOUNDS10,2,
6,6:PROCDelay(200):RL=RL+1:IF30-OPPROCACR:ENDPROC
1900GCOL=2,2
1910OPROCL=13,3,"Your final score was "+STR$BX)
1920IFX>=HX:THENCL=CL+CX:PROCL(S,B,"The high score is"):
BOTO1940
1930PROCL(0,B,"But the high score is still at "+STR$H
X)
1940PROCL(10,15,"Another game?")
1950A=GET:IFAS="Y":THEN440
1960IFAS="N":THENCL:END
1970BOTO1950
1980DEFPROCACR_code
1990TX=0
2000RESTORE2010:FORIS=4*900TB*977:READAX:713=AX:TX=TX+
AX:NEXT
2010DATA 32,18,9,160,0,177,12,89,124,9,145,112,200,1
92,24,208,244,95,164,128
2020DATA 185,208,9,133,113,185,240,9,133,112,160,8,24
165,112,101,129,133,112,144
2030DATA 2,230,113,136,208,242,96,169,0,133,130,166,1
30,189,169,9,133,129,201,0
2040DATA 208,9,230,130,163,130,201,20,208,237,96,189
114,9,132,129,32,0,9,165
2050DATA 129,9,208,9,167,1,157,188,9,76,102,9,201
74,208,5,149,255,157
2060DATA 188,9,24,165,129,125,188,9,133,129,157,148,9
32,0,9,76,32,9,76
2070FORI=TX+OT031:READAX,BX:TX=TX+AX+BX:IX7212=AX:IX72
544=BX:NEXT
2080DATA48,0,50,120,53,0,55,128,50,0,60,120,63,0,65,1
28,68,0,70,129,63,0,75,128,78,0,80
2090DATA129,83,0,85,128,88,6,90,128,93,0,95,128,98,0,1
00,128,95,0,105,128,108,0,110,128
2100DATA113,0,115,128,119,0,120,128,123,0,125,128
2110FORI=TX+OT023:READAX:TX=TX+AX:IX7847C=AX:NEXT
2120DATA70,1,1,3,7,3,1,1,3,3,15,15,15,3,3,0,2,2,3,1
1,3,2,2
2130IFTX>18624:THENPRINT"Error in data":END
2140ENDPROC
2150DEFPROCInstructions
2160CLS
2170PRINT" You are Krazy John , the foolhardy"
2180PRINT"climber, and must try to climb the high"
2190PRINT"rise building before your time runs out."
2200PRINT"Climb up the ladders and run along the"
2210PRINT"riders avoiding the fireballs that"
2220PRINT"sprawl along the floor. Jump the unsafe"
2230PRINT"riders that are flashing and try to"
2240PRINT"reach the top of the screen before your"
2250PRINT"time runs out. Collect points on the"
2260PRINT"way by collecting the blocks that lower"
2270PRINT"the elevator. Gain bonus points by"
2280PRINT"climbing the final ladder ."
2290PRINT" Climbing the final ladder ."
2300PRINT" Climbing the final ladder ."
2310REPEAT UNTIL GET=32
2310CLS
2320PRINT" To control your man use the following"
2330PRINT"keys :
2340PRINT TAB(15):CHR(130):? LEFT"
2350PRINT TAB(15):CHR(130):X RIGHT"
2360PRINT TAB(15):CHR(130):Z DOWN"
2370PRINT TAB(15):CHR(130):I UP"
2380PRINT TAB(10):CHR(130):RETURN JUMP"
2390PRINT" One final note, becareful near the"
2400PRINT"edges of the riders as fireballs are"
2410PRINT"likely to appear. Just as the fire"
2420PRINT"sprawls through the building."
2430PRINT"CHR(130)"Press SPACE BAR to continue..":
2440REPEAT UNTIL GET=32
2450ENDPROC

```

the top right hand corner. As the game progresses, more and more fireballs appear, and must be avoided at all costs. To move your man, use the following keys: Z left; X right; : up; / down; Return jump.

As the program uses many of the special features of the BBC Micro, it would be difficult to convert to any other computer. For those of you who are interested in modifying the program, I will give a brief description of what the main parts do.

Lines	Description
60	Trap any errors in the program
70 to 100	Print the title
110 to 140	Print instructions if required
150 to 170	Define sound envelopes
180 to 420	Define user characters
430	Read in machine code
450	Set up main variables for machine code
470	Make cursor invisible
480	Set up main variables for game
490	Print screen
500	Move fireballs
510 to 520	Have you stepped on a fireball?
530 to 570	Move your man
610	Define graphics window
620	Update score
630 to 640	Read character at given co-

	ordinates
650 to 1780	Print screen
780 to 800	Print girders
810 to 920	Print ladders
950 to 1020	Put gaps in girders
1090 to 1110	Add yellow blocks to screen
1130 to 1230	Set up fireballs
1290	Delay loop
1300	Plot man
1310 to 1330	Move man left
1340 to 1360	Move man right
1370 to 1400	Move man up
1410 to 1430	Move man down
1440 to 1530	Jump up
1540 to 1580	Jump to left
1590	Plot man jumping to left
1600	Plot man jumping to right
1610 to 1650	Jump to right
1660 to 1680	Move fireballs
1690 to 1700	Fall down a gap
1710 to 1790	Collect a yellow block
1800	Go on to next screen
1810 to 1820	Update bonus timer
1830	Print in double height writing
1840 to 1890	Your man has died
1900 to 1930	Print your score and the high score
1940 to 1970	Play another game if required
2000	Read in machine code from data
2010 to 2100	Machine code in data
2130	Check for no errors in data
2150 to 2450	Print instructions

The main variables used in the program are as follows:

A\$ General input

move	Pointer to machine code to move fireballs
poke	Pointer to machine code to Poke fireballs on screen
XP	Pointer to x positions of fireballs
YP	Pointer to y positions of fireballs
DI	Pointer to movement directions of fireballs
S%	Your score
W%	Screen number
M%	Number of men left
CH	Chance of a new fireball appearing
Xi%	Your x position
YI%	Your y position
k%	Whether a key has been pressed
U%	Character to be printed for the man
L%	Number of yellow blocks left

To save memory, I have removed all unnecessary spaces from the program, so when typing in the program, do not add extra spaces. I also stored the machine code in pages 9 and 10. These pages are only used occasionally, so it is quite safe for a temporary store of machine code.

I have managed to test the program on both the 0.1 O.S. and the 1.2 O.S., with success, so the program should, hopefully, work on all versions. One final note, I have included a test in line 2130 to trap any errors in the data, before it is too late. I suggest that you include this line, otherwise the program could be overwritten by the machine code.

Learning is fun with Ollie Octopus

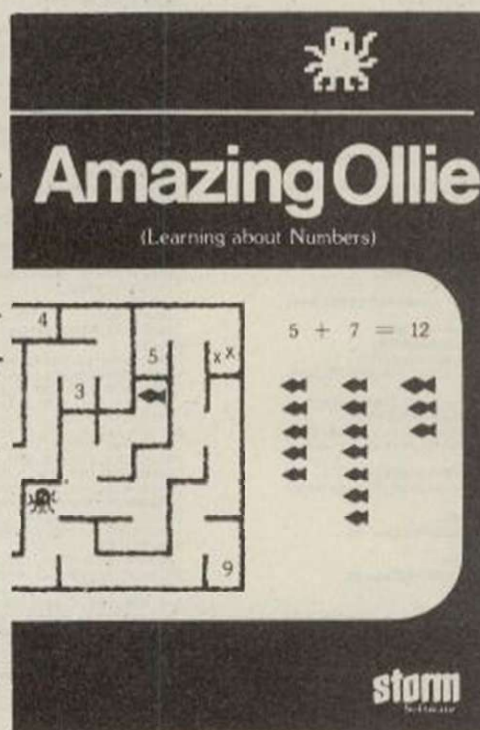
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THE GUARDIAN

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1 POKE649,1:RND=11:
10 DATA CLOAK OF INVISIBILITY, SWORD OF INVINCIBILITY, GLASS OF PROPHECY, RING OF ST
RENGTH
20 DATA HELMET OF SIGHT, MASK OF POWER
30 DATA DUBLIN, VAMPIRE, TROLL, GIANT, WIZARD, THE GUARDIAN
40 DATA 20, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000
50 INPUT "DIFFICULTY: "; D: D=INT(RND(1)+1): FOR I=1 TO 5: C=C+CHR$(RND(1)*10+48)
60 NEXT I
70 DIM M(5), T(5), C(5), T(5), M(5), P(5), M(5), D(5), S(5)
80 FOR I=0 TO 9: READ T(I): NEXT I: FOR I=0 TO 9: READ M(I): NEXT I: FOR I=0 TO 4: READ S(I): NEXT I
90 FOR I=0 TO 9: READ T(I): NEXT I: FOR I=0 TO 9: READ M(I): NEXT I: FOR I=0 TO 4: READ S(I): NEXT I
100 S=100: A=20: EL=10: LE=10: SS=PEEK(648)*256+POKE(649)*256+10: CL=30720-(SS*7680)*30
110 FOR I=0 TO 9: T(I)=INT(RND(1)*5)+1: M(I)=T(I): T(I)=INT(RND(1)*10)
120 M(I)=T(I): NEXT I: FOR I=0 TO 9: T(I)=SS+7*22+5+INT(RND(1)*12)*22+INT(RND(1)*1
2) NEXT I
130 FOR I=0 TO 9: M(I)=INT(RND(1)*5)+1: M(I)=INT(RND(1)*10) NEXT I
140 A=114: W=88: T(7)=5-INT(RND(1)+.5)
150 M(7)=T(7)
160 PRINT "XXXXXXXXXX"

```

```

250 PRINT TAB(4); "X"
260 FOR I=1 TO 12: PRINT TAB(4); "X"
270 PRINT TAB(4); "X"
280 FOR I=0 TO 9: IF T(I)=0: CLEART(1,1): OR THEN 275
290 C=T(1,2)
295 IF C=PEEK(648)*256+161000=POKE(649)*256+1: GO TO 276
298 POKE(649), 42
299 NEXT I
300 IF RND(7) THEN PRINT "T" TAB(10); "X"
305 IF RND(8) THEN PRINT "S" TAB(10); "X"
310 IF RND(2) THEN PRINT "U" TAB(10); "X"
315 IF RND(8) THEN PRINT "I" TAB(10); "X"
320 IF RND(8) THEN PRINT "A" TAB(10); "X"
325 IF RND(8) THEN PRINT "N" TAB(10); "X"
330 IF RND(8) THEN PRINT "D" TAB(10); "X"
335 IF RND(8) THEN PRINT "7" TAB(10); "X"
340 IF RND(8) THEN PRINT "5" TAB(10); "X"
345 IF RND(8) THEN PRINT "3" TAB(10); "X"
350 IF RND(8) THEN PRINT "1" TAB(10); "X"
355 IF RND(8) THEN PRINT "0" TAB(10); "X"
360 PRINT "LEVEL: " LE: PRINT "T" TAB(10); "ROOM: " RM
365 GO SUB 3650: GO SUB 3660: GO SUB 3670
370 IF V=9 AND LE=5 THEN V=0: GO SUB 3680: PRINT "XXXXXXXXXXXX MIDDLE: " MID: C=C+2: 3)

```

(listing continued on next page)



Beware of the
dreaded
Guardian and his
cronies in Dirk
Lampe's quest
for treasure.

DEEP IN AN immense, dark and unexplored jungle, far away in another Galaxy stands a house who's unearthly builders have long since been forgotten. Rumours ooze forth from the house, rumours of horror and oppressing terror — and consistently, a tale of incalculable wealth and treasure trove of wisdom hidden deep within the evil recesses of the house.

The treasure is guarded by a completely evil and merciless creature — the Guardian — who need never sleep or rest, and watches constantly over the safe containing the treasure. You have learnt also that the safe is on the fifth floor of the house, and even that it is in room seven of that floor.

In the house lie 10 other treasures which may help you in your quest for the treasure, but each treasure is guarded by a servant of the Guardian — goblins, vampires, trolls, giants and wizards in increasing order of strength and power — who must be killed before the treasure they guard can be stolen.

The house itself is made up of five floors of 10 rooms, organised as follows:

			0
1	2	3	
4	5	6	
7	8	9	

There are 10 items of treasure, as already mentioned, scattered around the house, which may be of use to you. They are:

- 0 Cloak of Invisibility No goblin, vampire, troll or giant can see you when this is worn.
- 1 Sword of Invincibility Helps kill your adversaries.
- 2 Glass of Prophecy Tells you the first number of the safe's combination.
- 3 Ring of strength Reinivourates you.
- 4 Ring of healing Heals your wounds.
- 5 Key of treasures In combination with the safe combination, will open the safe.
- 6 Staff of wisdom Glows when enemies are present on your floor.
- 7 Shield of defence Protects you from your foe's blows.
- 8 Helmet of Sight If used within 30 seconds of the Guardian's death in the

(continued on next page)


```

386 REM
387 IFU=100THENSTOP
388 IFSC20#RND(1)CRMD90+20#RND(1)THEN1000
389 FC00#="DEAD"ANDT(1)000030"THENSTOP
390 B#=(A=107)*1+(A=113)*22+((A=114)*22)+((A=115)*1)
391 H#=(10HT#(1,1): IFINT(ASC(R#)/3)=ASC(R#)/3THEN200
392 IFU=0THENFORI=10TO100: IFI(1,0)0THENM(1,0)=INT(RND(1)*5)+1: M(1,1)=INT(RND(1)*10)
393 IFU=0THENNEXT
394 GET# IF#="" THEN1000
395 IF#C"1" THEN410
400 FORI=0TO9
401 GOSUB9900: PRINT"000000"$(I): FORJ=1TO15000: ((P$(I))="" )+1: NEXTJ:NEXT
410 IF#C"1" THEN430
420 B#=((A=107)*114+((A=113)*107)+((A=114)*115)+((A=115)*113))
430 IF#C"1" THEN450
440 B#=((A=114)*107)+((A=107)*113)+((A=115)*114)+((A=113)*115))
450 IF#C"1" THEN470
460 B#=((A=107)*115)+((A=113)*114)+((A=114)*113)+((A=115)*107))
470 P#0: IF#C"1" THEN510
490 P#1: IFPEEK(P0+B)=32THENPOKEP0,32: P0=P0+2: GOTO1000
495 IFPEEK(P0+B)=21ORPEEK(P0+B)=4THEN4000
500 W#W+1: GOSUB9900: GOSUB3650
510 IF#C"U" THEN570
520 T#="000000"
530 GET# IF#="" ANDT(1)00001" THEN530
540 IF#="" THEN570
550 IF#C"VAL(R#)" THEN570
560 ONVAL(R#)GOSUB3000,3100,3200,3300,3400,3500,3600,3700,3800,3900
570 IF#C"0" THEN610
580 IFPEEK(P0+B)042THEN610
590 FORI=0TO9: IFP0+B=T(1,2)ANDT(1,0)=LEANDT(1,1)=RNTHEHC[I]=I+9
595 NEXT
600 POKEP0+B,32: GOSUB9900: PRINT"000000"$(C): P$(C)=T$(C): WT=WT+W(C): T(C,0)=0: GOSUB3660
610 IF#C"1" THEN630
620 T#="000000"
630 GET# IF#="" ANDT(1)00001" THEN630
640 IF#="" THEN600
650 IF#C"VAL(R#)" THEN650
655 C#VAL(R#)
660 IFPEEK(P0+B)032THEN680
670 POKEP0+B,42: P$(C)="" : T(C,2)=P0+B: T(C,0)=LE: T(C,1)=RM: WT=WT+W(C): GOSUB3660
680 IF#C"0"ORELC1THEN720
690 EL=EL-1: S=S+INT(RND(1)*10)+20: SC=SC-50: GOSUB3660: IF#100THENS=100
700 W#W+INT(RND(1)*10)-20: IFW0THENW#0
710 GOSUB3670
720 IF#C"0"ORU00THEN760
730 IFPEEK(P0+B)066THEN760
740 P0=P0-SS: I#="" : H#="" : S#="" : I#="" : U#0: IF00#="R" THENG0#=""
750 P0#=((P0+406)*164)+((P0+269)*280)+((P0+164)*406)+((P0+280)*269))
750 C#((P0+406)*3)+((P0+269)*1)+((P0+164)*3)+((P0+280)*1): P0=P0+SS: RM#RM+C: GOTO200
760 C#P0: IF#C"0"ORAC1THEN790
770 C#C+8: IFPEEK(C)=32THENPOKEC,46: FORJ=1TO50: NEXTJ: POKEC,32: GOTO770
780 IFPEEK(C)=65THENPOKEC,32
785 H#H+1: GOSUB3670
790 IF#C"0" THEN1000
800 S#S-2#RND(1): R#="SUCOSH": IFPEEK(P0+B)=65THENR#="THUNK"
810 GOSUB9900: PRINT"000000"$(R)
820 IFPEEK(P0+B)=65THS#POKEP0+B,32
1000 POKEP0,B: POKEP0,C,6
1002 W#W+RND(1)/5: S#S+RND(1)/5: S#S+(P#1)*(WT-80)/25#RND(1)/5
1004 IFW0THENW#0
1006 IF#100THENS=100
1011 GOSUB3650
1015 IFU00THEN1060
1020 FORI=0TO100: IFR#M(1,1)ANDL#M(1,0)THEN1025
1024 GOTO1030
1025 U#U+1: D(U,0)=1
1030 NEXT
1040 IFU=0THEN1155
1050 FORI=1TOU: C#INT(RND(1)*5): GOSUB9950: PRINTH$(C): D(1,1)=C: D(1,2)=S(C): V#C
1055 D(1,3)=SS+59+INT(RND(1)*12)*22+INT(RND(1)*12): POKE(D(1,3),65: NEXT
1060 FORI=1TOU: IFPEEK(D(1,3))065THEND(1,2)=D(1,2)/2: IFI#C"0" THEND(1,2)=D(1,2)/2
1061 NEXT
1062 FORI=1TOU: IFI#C"0"ANDI(1,1)4THEN1150
1063 IF#C"1"RND(1,1)3THEN1150
1065 C#D(1,3): IFD(C)11ANDPEEK(X+22)=32THENPOKEK,32: D(1,3)=D(1,3)+22: GOTO1089
1070 IFD(C)11ANDPEEK(X+1)=32ANDPO=X0THENPOKEK,32: D(1,3)=D(1,3)+1: GOTO1089
1085 IFD(C)11ANDPEEK(X-22)=32THENPOKEK,32: D(1,3)=D(1,3)-22: GOTO1089
1087 IFD(C)0ANDPO=X011ANDPEEK(X-1)=32THENPOKEK,32: D(1,3)=D(1,3)-1: GOTO1089
1089 POKE(D(1,3),65: X#D(1,3)
1090 C#0: FORJ=1TO1: IFPEEK(X+J)106ANDPEEK(X+J)0160THENC=999
1091 NEXT
1092 FORJ=21TO-23: IFPEEK(X+J)106ANDPEEK(X+J)0160THENC=999
1093 NEXT
1094 FORJ=21TO23: IFPEEK(X+J)106ANDPEEK(X+J)0160THENC=999
1095 NEXT
1100 IFC=999ANDSH#C"0" THENS#S-(RND(1)+.25)*2#D(1,1): W#W+RND(1)*D(1,1)/2
1110 IFC=999ANDSH#C"0" THENS#S-(RND(1)+.25)*4#D(1,1)+1: W#W+RND(1)*4#D(1,1)+1: M(1,1)=1
1150 NEXT
1155 IFU00ORLE050RRM070R00#C"0" THEN1159
1156 U#U+1: D(1,0)=R#+1: D(1,1)=5: D(1,2)=200000: D(1,3)=SS+337: GOSUB9950: PRINTH$(5): V#5: G0#="R"
1157 GOTO1000
1159 IFU=0THEN380
1160 C#0: FORI=1TOU: IFD(1,2)010THEND(1,0,0)=0: GOSUB9950: PRINTH$(V): "DEAD,"
1170 IFD(1,2)010ANDI#UTHENC=999: IFD(1,1)=5THENG0#="DEAD": T(1)=000000"
1180 IFD(1,2)010ANDI#UTHENC=100
1190 IFD(1,2)010THENPOKE(D(1,3),32: SC=SC+C: D(1,2)+1)*10: GOSUB3660
1200 NEXT: IFC=999THENU#U-1: GOTO380
1210 IFC=0THEN380

```







```

1200 FOR I=1 TO POKE(1,3),32:NEXT U=0:GOTO380
3000 IF#="INVISIBL":RETURN
9100 IN#="INVICIBLE":RETURN
3200 GOSUB9900:PRINT"*****THE NUMBER IS "LEFT$(CC#,1):RETURN
3300 S=100:RETURN
3400 W#=:RETURN
4000 IFM<7ORLE<5OROG<0:"DEAD"ORPEEK(P+R)<171 THEN RETURN
9510 GOSUB9900:PRINT"*****ENTER COMBINATION":H$(:)=""
3520 FOR I=1 TO S
3530 GETA$:IF A$="" THEN S=30
3540 H$(I)=H$(I)+A$:NEXT
3550 IF CC#=H$(S) THEN STOP
3560 RETURN
3600 A$="NO":FOR I=RETN:IF L=#(I,0) THEN H$="STAFF GLOWS"
3610 NEXT I:GOSUB9900:PRINT"*****AS PRINT"?:RETURN
3630 PRINT"AND":PRINT"*****INT(S):PRINT"?:TAB(10)"HOUNDS
      INT(W)
3655 RETURN
3660 PRINT"AND":PRINT"*****WT PRINT"?:TAB(10)"SCORE IN
T(SC):RETURN
3670 PRINT"AND":PRINT"*****AR PRINT"?:TAB(10)"ELIXIR
      EL:RETURN
3700 SH#="ON":RETURN
3900 IFM<7ORNDLE<5ORNDGS<0:"DEAD"THEN RETURN
3910 GOSUB9900:PRINT"*****RIGHT$(CL#,1):RETURN
3990 H$="ON":RETURN
4000 IFPEEK(P+R)=21 THEN PRINT"#:GOSUB3600:IFA$="HO" THEN LE=L+1:RM=0:PQ=P+1:A=1
14:E=22:Y=9:GOTO200
4010 IFPEEK(P+R)=4 THEN LE=L-1:RM=0:PQ=P-1:A=114:B=22:S=S-1:GOTO200
4020 GOTO380
9000 POKE36875,15:POKE36877,230:FOR I=1 TO 100:NEXT I:POKE36877,0:RETURN
9300 PRINT"*****":RETURN
9350 PRINT"*****"
9360 PRINT"*****"

```

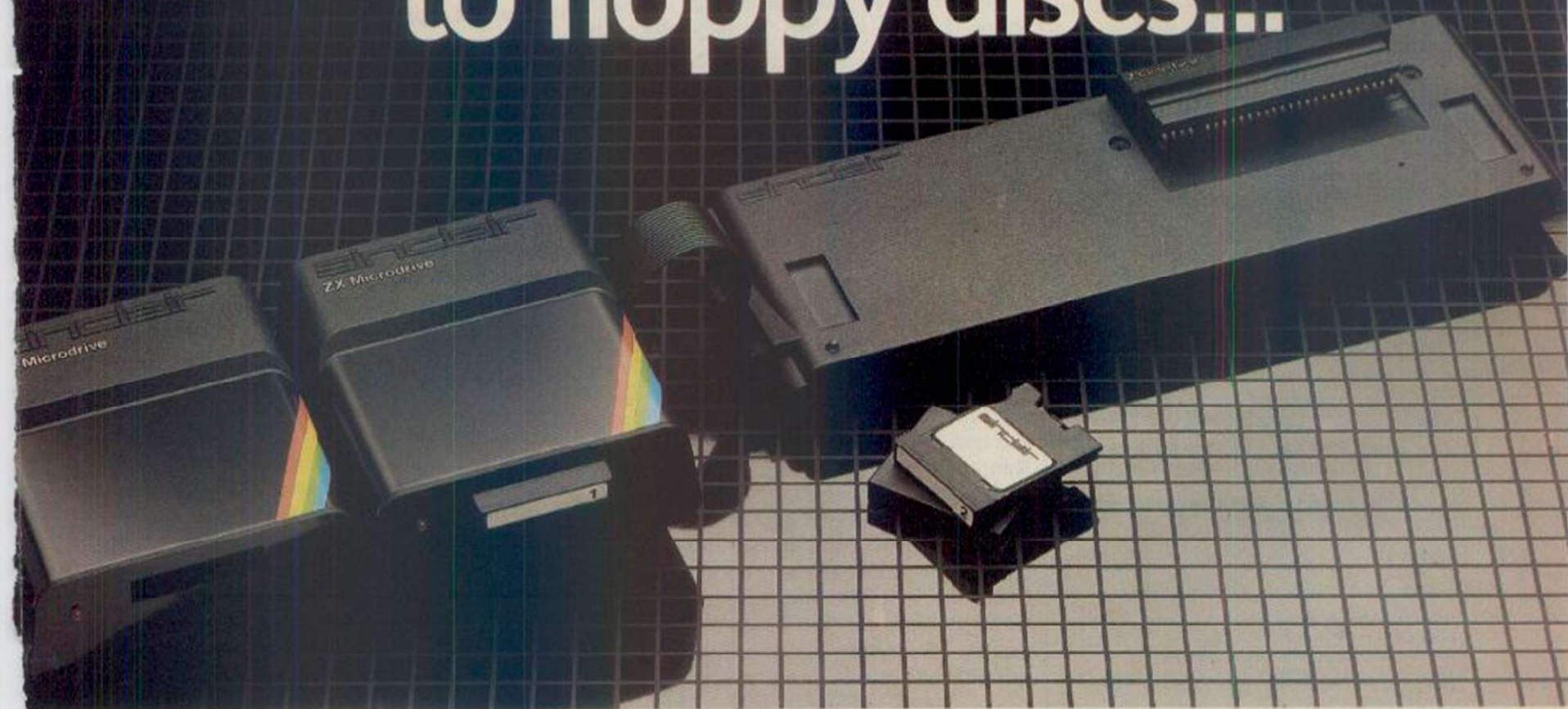
In order to open the safe, you must reach the Guardian's room, kill him, and then place the Key of Treasures in the lock, and enter the combination. The key is placed in the lock by facing the safe and typing U5. The combination is a five digit number. The first digit is obtained from the Glass of Prophecy, the next three on arrival at the top floor, and the last on the Guardian's death — as described above. The safe must also be opened within 30 seconds of the Guardian's death, or else the treasure turns to dust.

←(Stab)	stabs an enemy standing directly in front of you — several are needed.
1 (Walk)	Move forward one pace.
U (Use)	followed within 1 second by a number from 0 to 9, and then the corresponding item — see previous list — will be used. eg: U3 uses the Ring of healing. This must be renewed each time a new room is entered.
I (Inventory)	Tells you which items you are carrying — and can hence use.
O (Open)	Opens a door in front of you.
P (Put)	Followed within 1 second by a digit, and the corresponding item is placed on the floor on front of you.

S (Shoot)	Fire an arrow — several are required.
D (Drink)	Drinks an elixir which helps you to recover your strength and from wounds — but knocks 50 off your score.
L (Left)	Turns you left.
:	Turns you to face the opposite direction.
;	Turns you right.
G (Grab)	Grabs an object in front of you.
* An item of treasure (0-9).	
	A servant of the Guardian, or the Guardian.
	The safe.
	A door.
	The wall.
u	Steps leading upstairs.
d	Steps leading downstairs.

Sinclair ZX Microdrives and ZX Interface 1

The affordable alternative to floppy discs...



...in the shops, now!

The unique ZX Microdrive system sets the ZX Spectrum apart from all other computer systems.

At a fraction of the cost of floppy discs, it gives fast access to 85K of program and data on Microdrive cartridges. And it opens up exciting possibilities through an RS232 interface and local area network.

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- Only 9 seconds to LOAD a typical 48K program.

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ZX Interface 1 is a multi-purpose device. It controls up to 8 Microdrives. And it adds file-handling and communication facilities to your Spectrum.

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Available from: larger branches of Boots • WH Smith Computer Stockists • Greens Computer Centres • Spectrum Computer Stores • and larger branches of John Menzies • Dixons • Laskys • Currys • John Lewis Partnership • Rumbelows • British Home Stores • House of Fraser and many other good computer stockists nationwide.

Find out more – in your local shop!

The best way to evaluate ZX Microdrives and Interface 1 is to see them for yourself.

There is a full range of ZX peripherals – including ZX Interface 2 for joystick and ROM Cartridge capability, alongside the only computer that supports them – the ZX Spectrum!

For more information, telephone Sinclair Research Ltd, on 0276 685311.

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Listing 1.

```
10PIX1=&B0:PIX2=&B1:BYTE=&B2:MEM1=&B8A
20FORI=0 TO3 STEP3
30PX=&C20
40OPTIX
50LDX #4:LDA #1:STA MEM1
60LDA #0:STA BYTE
70.LOOP
80LSR PIX2:BCC L1
90LDA MEM1:ORA BYTE:STA BYTE
100.L1
110ASL MEM1:LSR PIX1:BCC L2
120LDA MEM1:ORA BYTE:STA BYTE
130.L2
140ASL MEM1:DEX:BNE LOOP
145RTS:J
150NEXT
160VDU23,224,16,32,64,254,254,64,32,16
170VDU23,225,24,60,90,90,24,24,24,24
180VDU23,226,24,24,24,24,90,90,60,24
190VDU23,227,0,126,66,90,90,66,126,0
```

Listing 2.

```
OREM LEFT SCROLL
10SCRFROM=&70:SCRT0=&72:MEM1=&78:M
EM2=&79:MEM3=&7A
20FORI=0 TO2 STEP2
30PX=&D25
40OPTIX
50LDA #7:STA SCRT0+1:STA SCRFROM+1
60LDA #6:STA SCRT0:LDA #32:CLC
70ADC #6:STA SCRFROM:BCC L8
80INC SCRFROM+1
90.L8
100LDA #8:STA MEM2
110.L6
120LDX #224
130LDA #0:STA MEM1
140.L1
150LDY MEM1
160LDA (SCRFROM),Y
170STA (SCRT0),Y
180INC MEM1
190DEX:BNE L1
200LDA #128:CLC:ADC SCRFROM:STA SC
RFROM:BCC L5:INC SCRFROM+1
210.L5:INC SCRFROM+1:INC SCRFROM+1
220LDA #128:CLC:ADC SCRT0:STA SCRT0
:BCC L7:INC SCRT0+1
230.L7:INC SCRT0+1:INC SCRT0+1
240DEC MEM2:BNE L6
250RTS
260J:NEXT
```

Listing 3.

```
OREM RIGHT SCROLL
10SCRFROM=&70:SCRT0=&72:
MEM1=&78:MEM2=&79:MEM3=&7A
20FORI=0 TO2 STEP2
30PX=&D75
40OPTIX
50LDA #7:STA SCRT0+1:STA SCRFROM+1
60LDA #6:STA SCRFROM:LDA #32:CLC
70ADC #6:STA SCRT0:BCC L8
80INC SCRT0+1
90.L8
100LDA #8:STA MEM2
110.L6
120LDX #224
130LDA #223:STA MEM1
140.L1
150LDY MEM1
160LDA (SCRFROM),Y
170STA (SCRT0),Y
180DEC MEM1
190DEX:BNE L1
200LDA #128:CLC:ADC SCRFROM:STA
SCRFROM:BCC L5:INC S
CRFOM+1
210.L5:INC SCRFROM+1:INC SCRFROM+1
220LDA #128:CLC:ADC SCRT0:STA
SCRT0:BCC L7:INC SCRT0+1
230.L7:INC SCRT0+1:INC SCRT0+1
240DEC MEM2:BNE L6
250RTS
260J:NEXT
```

Listing 4.

```
OREM SWAP
10DAT=&70:NCHR=&72:LP=&74:MEM1=&76
20FORN=0 TO3 STEP3:PX=&DC5
30OPTNX
40LDA #246:STA DAT:LDA #13:STA DAT+1
50LDY #2:STY LP:INY:STY LP+1
60LDY #0
70.LOOP1
60LDA (NCHR),Y:TXA:LDA (DAT),Y
90STA (NCHR),Y:TXA:STA (DAT),Y
100INC NCHR:BNE L1:INC NCHR+1
110.L1
120INC DAT:BNE L2:INC DAT+1
130.L2
140DEC LP:BNE LOOP1
150DEC LP+1:BNE LOOP1
160RTS
170J:NEXT
```

THIS PACKAGE, which is comparable to any on the market today, allows you first to define characters for Mode 2 — using all 16 colours — up to 21 by 21 pixels in size and then use these as interrupt-controlled sprites — they move independently of any programs also Running — which may be animated with up to 20 frames, be enlarged and shrunk to create 3D effects and which support full collision detection whereby a sprite may go into a termination sequence of frames, for example, on hitting another sprite.

If you have discs then you must revert to tapes as the disc memory space is used heavily by the system.

To type in the character definer first enter listing 1 and check it carefully. Save the program and Run it. If all is well type New as a direct command — do not perform a hard reset or switch off the computer — and enter, Save and Run listing 2. Type New and continue this process until listing 6. After Running this program type as a direct command

*SAVE"CODE" C00 + 1FF

Type New and type in listing 7 and Save it after checking. Run the program and save the code it produces using

*SAVE"CHARPRT" 1600 + FF

as a direct command. Now type New and enter listing 8. Save it and make a copy of Code and Charprt in that order just after it. Press Break and type in listing 9. Save this after Charprt and now the character definer is complete. To Run it Chain it from listing 8.

Now press Break and type

PAGE = &2000

and New as direct commands prior to typing in listing 10 which is the actual sprites routine. Check this very carefully, Save it and Run it. Now type New and enter listing 11, Save it and Run it. To save the code produced by these two programs use as direct commands:

*SAVE"SPRITES" E00 + 4FF

and

*SAVE"CHARVIEW" C00 + 30

Type New and enter and Save listing 12. After it make a copy of Sprites and Charview and the sprite definer is complete.

Follow the instructions on the screen to get the grid on which to draw the character. The movement keys — Z, X, / and : — move the cursor over the grid and the commands Fill — F — and Delete — D — cause the pixel under the cursor to take on the cursor's colour or become blank.

SCROLL: If your character is larger than 8 by 8 you can draw on the rest of the character by pressing S and using the movement keys to

Listing 7.

```
OREM CHARACTER PRINT
10LB=&70:HB=&71:HT=&72:WD=&73
20XC=&74:YC=&75:CRDAT=&76
30MEM1=&78:MEM2=&79:MEM3=&7A:MEM4=&7B
40MEM5=&7C
50FORI=0 TO3 STEP3:PX=&1600
60OPTIX
70LDA 3574:STA WD:LSR WD:LDA 3575:STA HT
80LDA #248:STA CRDAT:LDA #13:STA CRDAT+1
90LDA #44:STA XC
100LDA #7:STA YC
110.LD HIMEM
120LDA #6:STA LB:LDA 7:STA HB
130LDA #0:STA MEM1
140ASL XC:BCC L1
150INC MEM1
160.L1:ASL MEM1:ASL XC:BCC L2
170INC MEM1
180.L2:ASL MEM1:ASL XC:BCC L3
190INC MEM1
200.L3:LDA XC:CLC:ADC LB
210STA LB:BCC L6:INC MEM1
220.L6
```

Listing 8.

```
10MODE7
20PRINTTAB(9,1)CHR#130:STRING$(18,"")
30FORN=2 TO3:PRINTTAB(7,N)CHR#141"
Character definer.:NEXT
40PRINTTAB(9,4)CHR#130:STRING$(18,"")
45VDU28,11,22,30,20
50*LOAD"" C00
60*LOAD"" A00
70PAGE=&1700:CHAIN""
```

move the 8 by 8 window over the relevant part of the character.

TURN: This rotates the character a quarter of a revolution anticlockwise but only if the character has equal height and width. If not this command does nothing.

REFLECT: If vertical half is selected this command copies the left half of the character on to the right and if horizontal half is selected the top half of the character is copied on to the bottom. If vertical whole is chosen the character inverts about a line vertically through its centre and if horizontal whole is chosen the character inverts about a line horizontally through its centre.

SWAP: Up to four characters may be held in memory simultaneously. Character 0 is the one you see and may alter but to operate on the other characters you may swap character 0 with characters 1 to 3.

When swapping always swap the character back to where it originated or you will lose track of it. For example, to operate on character 1 and then on character 2: Swap 0 and 1 — operate on character 1; Swap 0 and 1; Swap 0 and 2 — operate on character 2; Swap 0 and 2.

SAVE: Uncompiled — this saves character 0 so that it may be loaded using the program's Load routine so that it may be operated on later. Compiled — this saves the character in the shorter form used by the routine to print on to a Mode 2 screen. It also strips the character of any blank rows and columns before saving so it is always worth using a square character larger than needed to allow Turning so that you know excess rows and columns will not be saved with the compiled character.

After saving your characters note the order they are on the tape because when loading you will not be able to see the filename.

LOAD: This loads uncompiled code only into next free character space i.e., the one after the last one used. If all the characters are being used you will be prompted to enter which one you wish to overwrite, if any.

You are always prompted for the filename of the data to be loaded so always note this when saving a character.

QUIT: This quits on the current character

```
230LDA MEM1:CLC:ADC HB:STA HB
240LDA YC:STA MEM1
250LSR MEM1:LSR MEM1:LSR MEM1
260LDA MEM1:STA MEM2
270LSR MEM2
280BCC M1
290LDA #128:CLC:ADC LB
300STA LB:BCC M1
310INC HB
320.M1:LDA MEM2:CLC:ADC HB
330STA HB:ASL MEM1
340LDA MEM1:CLC:ADC HB:STA HB
350LDA YC:AND #7
360CLC:ADC LB:STA LB:BCC L4
370INC HB
380.L4
390LDY #0:LDX HT
400STX MEM1:STY MEM2
410.N1:LDY #0:STY MEM3:LDX WD
420.N2:LDY MEM2
430LDA (CRDAT),Y:STA #80
440INY:LDA (CRDAT),Y:STA #81
450INC MEM2:INC MEM2
460BNE N6:INC CRDAT+1
```


and allows you to redefine its height and width.

After defining and saving your characters use the following commands after switching the machine on to enter the program that allows you to define sprites.

```
PAGE = 82000
NEW
LOAD "listing 12"
*LOAD "SPRITES"
RUN
```

This program first loads in the character data that you saved using the previous program so after typing Run — as shown above — place the cassette with the character data on it into your tape player and press play. The program will say at what location in memory it is going to load the character so note this next to the character's filename.

After loading a character the program will ask you if you wish to load any more characters or stop. Continue loading until you have all the characters you are going to use and then stop. You should now have a list like the one below:

FILENAME	ADDRESS
Alien 1	4864
Ship	4900
Fruit	4950
etc ...	

Once you have finished loading you may enter lines which control the sprite. This is done by entering Data lines starting at line no. 2 and going up in increments of two, the last data line being DATA 100 ie.,

```
2 DATA ...
4 DATA ...
6 DATA ...
8 DATA 100
```

Data lines may extend up to line 48 which, if used, must be Data 100.

The Data lines consist of numbers separated by commas each of which controls a particular aspect of the sprite's motion. Each Data line controls one sprite — see figure 1.

After number 20 enter in the order you wish to be displayed the addresses of characters that will make up the sprite followed by the addresses of the characters that will make up the termination sequence. Up to 20 addresses in total may be entered after number 20.

After entering the Data lines type as a direct command Goto 50. This will make code you may *Save which on *Loading later will give you your sprites ready to use in your own program.

After typing Goto 50 you will be prompted for a start address at which to place the code that controls the sprites. After you loaded the

(continued on next page)

```
470.N6
480STX MEM5
490JSR &C20:LDA &B2
500LDX MEM5
510LDY MEM3:STA (LB),Y
520LDA #8:CLC:ADC MEM3:STA MEM3
530DEX:BNE N2
540INC YC:BNE R1:LDA HB:SEC:SBC #77:STA HB
    N5:DEC HB:BNE N5
550LDA LB:SEC:SBC #135:STA LB:BCS
560.R1:LDA #7:AND YC
570BNE N3
580LDA #121:CLC:ADC LB
590STA LB:BCC N4
600INC HB
610.N4:INC HD
620INC HB:BNE N5
630.N3~
640INC LB:BNE N5
650INC HB
660.N5
670DEC MEM1:BNE N1
680RTS
690J:NEXT
```



A sneak preview of the full sprite arcade game from next month's Bobby Rao article.

BBC SPRITES

Full collision detection, animation and independent movement in part 1 of Bobby Rao's sprites package.

Listing 5.

```
LOAD
OREM COMPILER
10DAT=3574:CRDAT=&76:CRDAT1=&7B
20HT=&72:WD=&73:WD1=&74
30DIS1=&70:CN1=&71
40PXBT=&C20
50PIX1=&B0:PIX2=&B1:BYTE=&B2
60DIS2=&B5
70FORNZ=0 TO3 STEP3
80PX=&C46
90OPTNX
100LDA #248:STA CRDAT:STA CRDAT1::
    LDA #13:STA CRDAT+1:STA CRDAT1+1
110LDA #2:STA CN1
120LDA #0:STA DIS1
130.L1
140LDA #0:STA DIS2
150.L2
160LDY DIS2
170LDA (CRDAT),Y:STA PIX1
180INY:LDA (CRDAT),Y:STA PIX2
190JSR PXBT
200LDY DIS1:LDA BYTE:STA (CRDAT1),Y
210INC DIS1
220INC DIS2:INC DIS2:BNE L2
230INC CRDAT+1
240DEC CN1
250BNE L1
260LSR DAT
270RTS
280J:NEXT
```

Listing 6.

```
OREM SHORTEN
10HT1=&B5:CRDAT=&76
20HT=&72:WD=&73:WD1=&74
30WDS=&7B:WDF=&79:HTS=&7A:HTF=&7B
40DIS1=&70
50FORNZ=0 TO3 STEP3
60PX=&C83
70OPTNX
80LDA 3574:STA WD1:LDA 3575:STA HT1
90LDA #248:STA CRDAT:LDA #13:STA CRDAT+1
100LDA #0:STA WDS:STA HTS
110LDA WD1:STA WDF:LDA HT1:STA HTF
120LDY #0
130LDA HT1:STA HT
140.J2
150LDA WD1:STA WD
160.J1
170LDA (CRDAT),Y:BNE N1
180INY:DEC WD:BNE J1
190INC HTS:DEC HT:BNE J2
200.N1
210LDY #255
220LDA HT1:STA HT
230.K1
240DEC HTF
250LDA WD1:STA WD
260.K2
270LDA (CRDAT),Y:BNE N2
280DEY:DEC WD:BNE K2
290DEC HT:BNE K1
300.N2
310LDY #0:STY DIS1
320LDA WD1:STA WD
330.L1
340LDY DIS1
350LDA HT1:STA HT
360.L2
370LDA (CRDAT),Y:BNE N3
380TYA:CLC:ADC WD1:TAY
390DEC HT:BNE L2
400INC DIS1
410INC WDS:DEC WD:BNE L1
420.N3
430LDY WD1:DEY:STY DIS1
440LDA WD1:STA WD
450.M1
460DEC WDF
470LDY DIS1
480LDA HT1:STA HT
490.M2
500LDA (CRDAT),Y:BNE N4
510TYA:CLC:ADC WD1:TAY
520DEC HT:BNE M2
530DEC DIS1
540DEC WD:BNE M1
550.N4:RTS
560J:NEXT
```


(continued from previous page)

code for the characters the program will have told you the next free address so enter this here. Also you will be prompted to enter the number of the first sprite so enter 1 here. To view your sprites use Goto 100 as a direct command.

Next month I will explain how sprites may be implemented in your own Basic programs and will give the listing for the fast arcade game shown on page 120. If you cannot be bothered to type in all the listings, they are available — together with the game — for £3.50 from B Bao, 12 Parkstone Close, Mowbury Park, Bedford MK41 8BD.

Position of number in Data line	Figure 1. Significance of number
1	Sets initial X-co-ordinate of sprite. This number can be between 0 — left-hand edge of screen — and 79 — right-hand edge of screen.
2	Sets constant X-axis displacement of sprite — i.e., distance it moves each time. Can be between -4 — left fast — and 4 — right fast.
3	Sets initial Y-co-ordinate of sprite. Can be between 0 — top of screen — and 255 — bottom.
4	Sets constant Y-axis displacement of sprite. Can be between -4 — up fast — and 4 — down fast.
5	Number of frames of animation of normal sprite. Must be 1 or more.
6	Number of frames of animation of sprite's termination sequence. Must be 1 or more. The above two numbers concern a facility that allows different characters to be displayed one after the other allowing animation.

7	Used internally. Set to 150.
8	Used internally. Set to 0.
9	Width magnification. Can be between 1 — normal width — and 4. When using this facility — i.e., when the number is larger than 1 — ensure that starting from the left edge of the character every pair of pixels is of the same colour.
10	Internal use — set to 0.
11	Height magnification. Can be between 1 and 4. Works with any character — the restrictions for width magnification do not apply.
12	Internal use — set to 0.
13	Magnification increment. This sets by how much the width and height magnifications will increase every time the sprite moves. If set to 0 the sprite stays the size it was initially. If set to 1 the sprite doubles in both dimensions each frame. If set to 2 the sprite quadruples in both dimensions each frame. If the value is 128+ increment, when the width or height magnifications exceed 4 the value for the increment becomes negative so the sprite grows smaller again.
14	X- and Y-axis bounce. This controls the action of the sprite when it reaches the screen's edge.

X-axis	Y-axis	Action
0	0	Crosses edge to reappear on other side — wrap-round
1	4	bounces off edge like a ball
2	8	stops at edge
3	16	goes into termination sequence

Hence if the value here is 9 the sprite bounces off vertical — X-

Hence if the value here is 9 the sprite bounces off vertical — X-

	axis — edges and stops at horizontal — Y-axis — edges as $9 = 1 + 8$.
15	X-axis random displacement. This may be set between 0 — no random displacement — and 3 — large random displacement — and determines how large a random number should be added to the constant X-axis displacement each frame.
16	Y-axis random displacement. May be between 0 and 3.
17	Hit colours. May be set between 0 and 255 and controls which colours a sprite may crash into and which it may just pass through. If set to 0 a sprite goes through every colour but if 255 it goes into termination sequence on touching any colour except black. The best way to use this facility is to set it to 192 which causes the sprite to crash into any flashing colour but pass through the rest.
18	Termination sequence duration. When a sprite is in termination this value tells it how long to go on repeating its termination frames before disappearing. The value must be greater than 128 so to make a sprite repeat three frames 20 times as its termination sequence set this value to $128 + (3 \times 20) = 188$.
19	Internal use — set to 0.
20	Internal use — set to 0.
21	Set this to the address of the character to be displayed first i.e., frame one of the sprite.
22	This may either be set to the character that is displayed second — frame two — or if the sprite only has one frame to the address of the first frame of the termination sequence.

Listing 9.

```

SREM CHARACTER DEFINER
104F220,0
30DAT=3574:CHAR=3576:FREX=4088:FORNX=3576:T05629 ST
EP4:INZ=0:NEXT
70MODE7
90PRINTTAB(8,1):CHR$(141) Character definer."TAB(8,2)
CHR$(141) Character definer."TAB(9,3):CHR$(133):STRINB(10
" "
110PRINTTAB(0,5) Please enter EVEN WIDTH only."
130PRINTTAB(0,7):SPC(40):TAB(0,7) Char. width (2 to 64
) <RETURN> " : INPUTMX
150IFNDX<2:DRMDX=4:DRMDX=NDX:GOTO130
170PRINTTAB(0,9):SPC(40):TAB(0,9) Char. height (1 to
) : LLZ=(513/MX):IFLLZ<64:LLZ=64
190PRINT:LLZ) <RETURN> " : INPUTHTX:IFHTX<1:DRHTX=LL
3:GOTO170
200PRINTTAB(0,11) Sound on (Y or N)? : REPEAT:70X=32:
AS=GET$:UNTIL AS="Y" OR AS="N"
210IFAS="Y" :SDX=-10:ELSESDX=0
230DAT=MX:DAT=1:HTX
250MODE2:VDU23:0202:0:0:0
260MDX=7:DAT:HTX=DAT:1:PROCPCATRX:PROCPCIC
290CX=0:CYZ=0:CLX=0:SMX=0:CMX=0:CYZ=0:CLX=0:CLD
X=0:PXZ=0:TX=0:YX=0
370PROCCLIN
390REPEAT:PROCPCURSOR:PROCKEY:COLOUR128:PRINTTAB(0,28
) : SPC(60) : UNTIL SMX
470ON SMX:GOTO70,250
490DEFPROCPCATRX
530FORNX=0 TO 7:PRINTTAB(8,NX):CHR$(49+NX):TAB(NX,8):CHR
$(65+NX):NEXT
550PRINTTAB(0,12) : "P1:1":TAB(0,14) : "Curs":PROCPCAROMCO
L(0) : PRINTTAB(4,13) : CHR$(227):FERN=1:TO15:COLOURNX+128:P
RINTTAB(NX+4,13) : " : NEXT:COLOUR128:COLOUR6
630PRINTTAB(1,16) : "Up / Down 0-Quit":TAB(3,18) : "Z-Left
X-Right":TAB(1,20) : "F-Fill L-Delete":TAB(2,22) : "M-Swap
O-Colour":TAB(1,24) : "R-Reflect S-Scroll":TAB(0,26) : "T-Tur
n L-Load V-Save"
490GOTO0,6:MOVE704,960:HTX=4:DRAW704,968:HTX=4:MOVE6
96+MDX=8,960:HTX=4:DRAW696+MDX=8,968:HTX=4:MOVE712+MDX
=8,992:DRAW752+MDX=8,992:MOVE712+MDX=8,996:HTX=4:DRAW7
52+MDX=8,996:HTX=4
750ENDPROC
770DEFPROCPCRID
810F1X=7:F2X=7
830IFNDX<8:F1X=MDX-1
850IFHTX<8:F2X=HTX-1
870BTX=FNB:FORNX=0 TO 7:FORMX=0 TO 7:
890COLOUR128+BTX*7NX:PRINTTAB(NX,NX) : "NEXT:BTX=BTX+
MDX:NEXT
910COLOUR128:COLOUR7
930ENDPROC
950DEFPCOL3,7
970GOTO3,7
1010PLX=704+X*8:MOVEPLX,1012:DRAWPLX,1000:MOVEPLX+56
,1012:DRAWPLX+56,1000:PLX=792-Y*4:MOVE664,PLX:DRAM688
,PLX:MOVE664,PLX-20:DRAM688,PLX-20
1050ENDPROC
1070DEFPROCPCIC
1090PROCPCRID
1130CALL 8A00:ENDPROC

```

```

1170DEFPROCPCUP
1210VDU28,0,7,7,0:PRINTTAB(0,0):CHR$(11):VDU28,0,31,19,
0:YX=YZ-1:BDTX=FNB:
1290FORNX=0 TO 7:COLOUR128+BDTX*7NX:PRINTTAB(NX,0) : " :
NEXT
1310ENDPROC
1330DEFPROCPCDOWN
1350VDU28,0,7,7,0:PRINTTAB(0,7):VDU28,0,31,19,0:YX=YZ
+1:BDTX=FNB+MDX*7
1450FORNX=0 TO 7:COLOUR128+BDTX*7NX:PRINTTAB(NX,7) : " :
NEXT
1470ENDPROC
1490DEFPROCPCLEFT
1530X=X-1:BDTX=FNB:CALL 8D75
1570FORNX=0 TO 7:COLOUR128+BDTX*7NX:PRINTTAB(0,NX
) : " : NEXT
1590ENDPROC
1610DEFPROCPCRIGHT
1650X=X+1:BDTX=FNB+7:CALL 8D75
1690FORNX=0 TO 7:COLOUR128+BDTX*7NX:PRINTTAB(7,NX
) : " : NEXT
1710ENDPROC
1730DEFPROCPCURSEL
1750COLOUR128:PRINTTAB(9,CYX) : "TAB(CX0,9) : "TAB(
CLOX+4,14) : "TAB(CLOX+4,12) : " : COLOUR128+PX:PRINT
AB(CX0,CYX) : "
1790ENDPROC
1810DEFPROCPCRMBW
1830PROCPCURSEL:PROCPCOMCOL(CX)
1870PRINTTAB(9,CYX) : CHR$(224):TAB(CX,9) : CHR$(225):TAB(C
LX+4,14) : CHR$(226):TAB(0,14) : "Curs"
1930COLOUR128+7FNBYTE:IFCLX=0:COLOUR135:COLOUR7FNBYTE
1970PRINTTAB(CX,CYX) : CHR$(227):CLX=7FNBYTE:PROCPCAROMCO
L(CCLX) : PRINTTAB(CCLX+4,12) : CHR$(226):TAB(0,12) : "P1:1"
2050COLOUR128:COLOUR7:CLX=CLX:CYZ=CYZ:CLX=CLX:CLD
X=CCLX
2070ENDPROC
2090DEFPROCPCAROMCOL(CX)
2130IFCLX:COLOUR128:ELSECOLOUR135
2150COLOUR(CX):ENDPROC
2190DEFPROCPCKEY
2210BTX="X"/"O"/"D"/"RTM"/"V"
2230REPEAT
225070X=32:FX15,1
2270AS=GET$
2290UNTIL INSTR(8,"XO")>0
2310PRINTTAB(0,28) : "PXZ=7FNBYTE
2320SOUND1,SDX,(XX+CX)*4,1:SOUND1,SDX,(YX+CY)*4,1
2350IFAS="Z" : ANDCX=0 : CX=CX-1 : ENDPROC
2370IFAS="X" : ANDCX=MDX-1 : ANDCX=7 : CX=CX+1 : ENDPROC
2390IFAS="1" : ANDCY=0 : CYZ=CYZ-1 : ENDPROC
2410IFAS="/" : ANDCY=HTX-1 : ANDCY=7 : CYZ=CYZ+1 : ENDPROC
2430IFAS="O" : PROCCL:ENDPROC
2450IFAS="F" : FNBYTE=CLX:PROCPLT(CX):ENDPROC
2470IFAS="D" : FNBYTE=0:PROCPLT(0):ENDPROC
2490IFAS="S" : PROCPCURSOR:ENDPROC
2510IFAS="R" : PROCPCF:ENDPROC
2530IFAS="T" : PROCPCURSOR:ENDPROC
2550IFAS="M" : PROCPCAP:ENDPROC
2570IFAS="L" : PROCCL:ENDPROC
2590IFAS="V" : PROCPCV:ENDPROC
2610IFAS="Q" : ENDPROC
2615PRINT "You sure (Y or N)? : REPEAT:70X=32:AS=GET$
IF AS="Y" : FORNX=3574 TO 4087:7NX=0:NEXT:SMX=1:ELSE UNTI

```

```

LAS="N"
2620ENDPROC
2670DEFPROCPCCL
2710PRINT "Use 'Z' and 'X' keys 'C' to return."
2730REPEAT:70X=32
2750FX15,1
2760AS=GET$:SOUND1,SDX,CLX*16,1
2770IFAS="Z" : ANDCLX=0:CLX=CLX-1
2790IFAS="X" : ANDCLX<15:CLX=CLX+1
2810PROCPCURSOR
2830UNTIL AS="C"
2850ENDPROC
2870DEFPROCPCSCR
2890PRINT "Use Z, X, /, ' ' 'C' to return." : PR
OCPCURSEL
2930REPEAT:70X=32:AS=GET$:FX15,1
2950PROCCLIN:SOUND1,SDX,(XX+CX)*4,1:SOUND1,SDX,(YX+CY
X)*4,1
2970IFAS="Z" : ANDCX=0:PROCLEFT
2990IFAS="X" : ANDCX=MDX-B:PROCPCRIGHT
3010IFAS="/" : ANDCY>0:PROCPCUP
3030IFAS="/" : ANDCY=HTX-B:PROCPCDOWN
3050PROCCLIN
3070UNTIL AS="C"
3090PROCPCRID:ENDPROC
3130DEFPROCPCREF
3170COLOUR7:PRINTTAB(0,28) : "Horizontally (H) or Vert
ically (V)? : 'C' to return." : REPEAT:70X=32:AS=GET$
UNTIL AS="H" OR AS="V" : OR AS="C" : ENDPROC
3190PRINTTAB(0,30) : SPC(59) : TAB(0,28) : "Whole (W) or Half (H
)?" : REPEAT:70X=32:AS=GET$:UNTIL AS="W" OR AS="H"
3210PRINTTAB(0,28) : SPC(40) : TAB(0,28) : COLOUR2:IFC="W"
PRINT "Whole" : ELSEPRINT "Half" :
3230IFAS="V" : GOTO3290
3250COLOUR2:PRINT "Horizontally." : FORNX=0 TO HTX/2-1:BD
X=CHAR+NX+MDX:BDXZ=CHAR+(HTX-NX-1)+MDX:FORNX=0 TO MDX-
1:IFC="W" : BDZ=BDX*7NX:BDXZ=BDX*7NX:BDXZ=BDX*7NX:BDXZ=BDX*7NX:
BDXZ=BDX*7NX:BDXZ=BDX*7NX
3270NEXT:NEXT:GOTO3330
3290COLOUR2:PRINT "Vertically (V)?" : FORNX=0 TO MDX/2-1:BD
XZ=CHAR+NX:BDXZ=CHAR+(MDX-NX-1)+FORNX=0 TO HTX-1:MDX
STEPMDX:IFC="W" : BDZ=BDX*7NX:BDXZ=BDX*7NX:BDXZ=BDX*7NX:
BDXZ=BDX*7NX:BDXZ=BDX*7NX
3310NEXT:NEXT
3330PROCPCIC:GOTO3170
3350DEFPROCPCURTN
3370IFNDX<3:HTX:COLOUR1:PRINT "Character not square" : AS
=INKEY$(100):ENDPROC
3390BTX=CHAR+MDX:MDX=MDX:TXZ=MDX-1
3410PRINTSPC(61) : "Turning."
3430REPEAT:TFX=TX-1
3450FORNX=0 TO TFX:(TX+NX)=TX*7NX:NEXT
3470FORNX=0 TO TX:TXZ=TX*7NX:(TX+TX+NX+MDX):NEXT
3490FORNX=0 TO TX:(TX+TX+NX+MDX):NEXT
3510IFTFX<1:GOTO3550
3530FORNX=1 TO TFX:(TX+TX+MDX+NX)=?(TX+NX+MDX):N
EXT
3550FORNX=0 TO TFX:(TX+TFX+NX)=?(TX+NX+MDX):N
EXT
3570TX=TX+MDX+1:TXZ=TX-2:UNTIL TX<1
3590PROCPCIC:ENDPROC
3630DEFPROCPCMAP

```

(continued on page 124)

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```

3650$WX=1;PRINT"Which character to swap with (0 to 3
)?"
370*REPEAT:70X=32;NX=0;ET:UNTILNX>47 ANDNX<52;FRX=DAT+
(NX-48)*514
3690PROCDOK(&72,FRX):CALL&DC5
3710IFDAT $WX=2
3730XX=0;YX=0;ENDPROC
3750DEFPROCPLD1:FR1X=0
3790IFFRX<5600 Q0TD310 ELSEPRINT"Over which char (0
to 3 or 4 to return)"*REPEAT:FRX=0;ET:UNTILFRX>47 ANDFR
X<53
3800IFFRX=52 ENDPROC ELSEFRX=DAT+(FRX-48)*514;FR1X=1
3810PROCDOK(&72,FRX):CALL&DC5

```

```

3820FORN=(0 TO6FF:7*(A00+NZ)=7*(A00+NZ):NEXT
3830X=OPENUPFNNE:FORN=3574 TO4087:7NZ=8GET(X):NEXT
CLOSEX
3840FORN=0 TO6FF:7*(A00+NZ)=7*(A00+NZ):NEXT
3850PROC6OK(72,FREX):CALLDCS:SMZ=2
3870IFFR:X FREX=5700 ELSEFREX=FRX+514
3890ENDPROC
3910DEFPROC5V
3950PRIN"BAVE compiled (C) or uncompiled (U)?"
3970REPEAT:70X=32:AS=GET:UNTILAS="C" DRAS="":PRINT
AB(0,20B)5FC(60):IFA$="U" GOTO4050
39907B6A=(NDZ/2+HTZ):1CALL 6C46:IF7A(7)/7B ENDPROC
4010X=OPENDOWNFNNE:INPUTX,7A79,7A79:1BPUTX,7A79-7A7
A+1:FORN=7A7A TO7A7B:FORN=7A7B TO7A79:1BPUTX,7A7A+
(NX+NDZ/2)+N):NEXT:NEXT:FORN=3574 TO4087:7NZ=0:NEXT

```

```

SNX=1;GOTO4055
4050X=OPENOUTFNHME;FORNZ=3574 TD40B7;BPUT#X,7NZ;NEXT
4055CLOSE#1;ENDPROC
4060DEFFNME=PRINTAB(0,2B)SPC(59)TAB(0,2B)"Enter fill
enase (max,10 chars.) :<RETURN>";VDU2B,0,31,19,30;REPE
AT;INPUTB#1UNTILBS="";VDU2B,0,31,19,0
4070PRINTAB(0,2B)SPC(60)TAB(0,2B);#1=MI$B,0,10)
4100DEFPDPLT(CX)
4110GOCOLO,CX;PLOT67,704+(X+CX)*#B,992-(Y+CY)*#4;END
PROC
4150DEFFNBYTE=FNB+CX+MDX*CY2
4190DEFFNDEK(DK)=70KX+Z56+DK171
4230DEFFNPROCDB(DK,KX)=70KX+INDB256+DKX71+KXDIV256
4240ENDPROC
4290DEFFNTRN=CHAR+X+Y+MDX

```

```

100=&D00:ST=&E00
301=&70:MD=&71:HT=&72:MD=&73:XC=&74:YC=&75:C=&76:H
EN:Y7B:ZC=&79:MD:R3=&7A:ME:14=&7B
50TEMP=&7C:TEMP1=&7D:LB1=&7E:LB1=&7F:XC1=&80:YC1=&8
1:HT1=&82:MD1=&83:XT=&84:YXT=&85:YXT1=&86
70XTWD=&87:XTHT=&88:XD=&89:F=&8A:RX=&8B:RY=&8C:CNT=
&8D:FRQ=&8E:SRN=&8F
907F=1:7CNT=0:7SRN=0:7FRQ=19
110FORIX=0 TO3 STEP3:PX=ST
130OPTIX
150LDA S+9:STA C+1:LDA S+10:SEC:SEC #2:STA C
170BCS M10:DEC C+1
190.M10
210JSR DRN
230LDA S+10:STA YXT
250LDA S+6:CHP #150:BNE ABC2
270JMP ABC5
290.ABC2
310STA KC:LDA S+7:STA YC
330LDA S+9:STA XXT:LDA S+11:STA YXT
350LDA S+16:STA TEMP
370LDA #0:STA S+16
390JSR DRX
410LDA TEMP:STA S+16
430LDA S+17:BNE M20
450LDA #128:STA MEM1:RTS
470.W20:LDA S+12:AND #254:BEQ M1:BRI M2
490.M3
510ABL S+B:ABL S+10
530JMP M1
550.W2:LSR S+B:LSR S+10
570BNE M1
590LDA #1:STA S+B:STA S+10
610LDA S+12:AND #1:BEQ M1
630ORA #3:STA S+12
650JMP M3
670.M1
690.ABC5
710LDA S+17:AND #128:BNE ABC7
730DEC S+17:LDA S+4:CLC:ADC S+4
750LDY F:ABL F:CLC:ADC F:TAX:LDA S+10,X
770STA C:INX:LDA S+10,X:STA C+1
790INY:STY F
810LDA S+5:CHP F
830BCS ABC6
850LDA #1:STA F:JMP ABC6
870.ABC7
890ABL F:LDX F:LDA S+10,X
910STA C:INX:LDA S+10,X:STA C+1
930INX:STX F:LDR F
950LDA S+4:CHP F
970BCS ABC6
990LDA #1:STA F
1010.ABC6
1030JSR DRN
1040LDA C:STA S+10:LDA C+1:STA S+19
1050LDA #FEA9:AND S+14:STA MEM4
1070LDA #FEA8:AND S+14
1090CLC:ADC S+1:SEC:SEC MEM4:STA XD
1110LDA S+B:STA XXT:LDA S+10:STA YXT
1130LDA #0:TAX:STA MEM3
1150.F1
1170CLC:ADC MD:INX
1190CPX XXT:BNE P1
1210STA XTWD:STA MEM1
1230CHP #31:BCC M4
1250LDA #1:STA MEM3
1270LDA S+12:AND #254:BRI M4
1290LDA S+12:AND #1:BEQ M5
1310ORA #128:STA S+12
1330JMP M4
1350.W3:AND #1:STA S+12
1370.M4
1390LBI MEM1
1410LDA MD:STA MEM2:LSR MEM2
1430LDA MEM2:SEC:SEC MEM1:STA TEMP1
1450LDA S:CLC:ADC XD
1470CLC:ADC TEMP1
1490.F9
1510STA S
1530ABL S:STA S:BCC F1
1550CLC:ADC #80:STA S
1570.F1
1590LDA S
1610CHP #160:BCS F2
1630CHP #79:BEQ F2:BCC F2
1650SEC:SEC #80:STA S
1670.F2
1690.X BOUNCE
1710LDA S+13:AND #3:BEQ ABC3
1730LDA XD:BEQ ABC3
1750LDA S:CLC:ADC #4
1770CHP #78:BCS B3
1790LDA S:CLC:ADC XTWD:CHP #80:BCS B3
1810JMP ABC3
1830.B3
1850LDA S:SEC:SEC XD:STA S
1870LDA S+13:AND #3:CHP #2:BNE J1
1890JSR JLT
1910LDA S:JMP F9

```

1930.U1
1950CMP #3:BNE U2
1970JSR TERM
1990BNE ABC3
2010.U2
2030LDA S:SEC:BBC XD:STA S
2050LDA #0:SEC:BBC S+1:STA S+1
2070LDA S:JMP F9
2090.ABC3
2110LDA &FE6F:AND S+15:STA MEM4
2130LDA &FE68:AND S+15
2150CLC:ADC S+3:SEC:BBC MEM4:STA X
2170LDA #0:TAX
2190.F2
2210CLC:ADC HT:INX
2230CPX YX:BNF P2
2250STA XHT:STA MEM1
2270CMP #63:BCC M7
2290LDA MEM3:BNE W7
2310LDA S+12:AND #1:BEQ M6
2330ORA #128:STA S+12
2350JMP M7
2370.M6:ORA #1:STA S+12
2390.W7
2410LSR MEM1
2430LDA HT:STA MEM2:LSR MEM2
2450LDA MEM2:SEC:BBC MEM1:STA TEMP
2470CLC:ADC XD
2490CLC:ADC TEMP
2510STA S+2
2530.Y BOUNCE
2550LDA S+13:AND #12:BEQ ABC1
2570LDA XD:BEQ ABC1
2590LDA S+2
2610CLC:ADC #4
2630BCS B1
2650LDA S+2
2670CLC:ADC XHT:BCC B1
2690JMP ABC1
2710.B1
2730LDA S+2:SEC:BBC XD
2750STA S+2
2770LDA S+13:AND #12:CMP #B:BNE US
2790JSR <LT:JMP ABC1
2810.U3
2830CMP #12:BNE U4
2850JSR TERM
2870BNE ABC1
2890.U4
2910LDA S+2:SEC:BBC XD:STA S+2
2930LDA #0:SEC:BBC S+3:STA S+3
2950.ABC1
2970LDA S+B:STA XX:STA S+9
2990LDA S+10:STA YX:STA S+11
3010LDA S+STA XC:STA S+6
3030LDA S+2:STA YC:STA S+7
3050JFF RT
3070LDA S+2:SEC:BBC TEMP
3090STA S+2
3110LDA S:SEC:BBC TEMP1
3130STA S
3150LDA #0:STA MEM1:RTS
3170.GRT
3190LDA YC:STA YC1:LDA XC:STA XC1
3210BPL LO:LDA #0:STA XC

```

3230LDA S+2;SEC;SBC XD;SEC;SBC XD;STA S+2
3250LDA #0;SEC;SBC S+2;STA S+2
3270.LO
3290\ LD H1MEM
3310LDA #1;STA LB;LDA 7;STA HB
3330LDA #0;STA MEM1
3350ASL XC;BCC L1
3370INC MEM1
3390.L1;ASL MEM1;ASL XC;BCC L2
3410INC MEM1
3430.L2;ASL MEM1;ASL XC;BCC L3
3450INC MEM1
3470.L3;LDA XC;CLC;ADC LB
3490STA LB;BCC L6;INC MEM1
3510.L6
3530LDA MEM1;CLC;ADC HB;STA HB
3550LDA YC;STA MEM1
3570LSR MEM1;LSR MEM1;LSR MEM1
3590LDA MEM1;STA MEM2
3610LSR MEM2
3630BCC N1
3650LDA #128;CLC;ADC LB
3670STA LB;JCC N1
3690INC HB
3710.M1;LDA MEM2;CLC;ADC HB
3730STA HB;ASL MEM1
3750LDA MEM1;CLC;ADC HB;STA HB
3770LDA YC;AND #7
3790CLC;ADC LB;STA LB;BCC L4
3810INC HB
3830.L4
3850LDA HT;STA HT1
3870LDA #0;STA MEM1
3910.M1;LDA YXT;STA YXT1
3930.N1
3950LDA #0;STA MEM2
3970LDA LB;STA LB1;LDA HB;STA HB1
3990LDA WD;STA WD1
4010LDA XC;STA XC
4030.N10
4050LDX TXT
4070.N2
4090LDA XC;CMP #0;BNE N5
4110LDA LB;CLC;ADC MEM2;STA LB1
4130BCC N7;INC HB1
4150.N7
4170LDA LB1;SEC;SBC #128;STA LB1
4190LDA HB1;SBC #2;STA HB1
4210LDA #0;STA MEM2
4230.N5
4250LDY MEM1
4270LDA (C),Y
4290STA MEM4
4310BEQ H1
4330LDA S+16;BEQ H1
4350LDY MEM2;AND (LB1),Y
4370BEQ H1
4390LDA S+17;AND #127
4410BEQ H2
4430JSR TERN
4450BNE H1
4470.H2
4490JSR HLT
4510.H1
4530LDA MEM4
4550LDY MEM2
4570ODR (LB1),Y;STA (LB1),Y
4590TYA;CLC;ADC #0;STA MEM2
4610BNE NR;INC HB1
4630.NR
4650INC XC
4670ODR;BNE N2
4690INC MEM1
4710DEC WD;BNE N10
4730.N6
4750INC YC;BNE N14
4770LDA LB;SEC;SBC #135;STA LB
4790LDA HB;SBC #77;STA HB
4810JMP N4
4830.N14;LDA #7;AND YC1
4850BNE N3
4870LDA LB;CLC;ADC #121;STA LB
4890LDA HB;ADC #2;STA HB
4910BNE N4
4930.N3
4950INC LB;BNE N4
4970INC HB
4990.N4
5010DEC YXT1;BEQ N12
5030LDA MEM1;SEC;SBC WD;STA MEM1
5050JMP N1
5070.N12
5090DEC HT1
5110BEQ RT
5130JMP N11
5150.RT
5170RTS
5190.M1;LDY #0;LDA (C),Y;STA WD;INY;LDA (C),Y;STA HT
5210LDA C;CLC;ADC #2;STA C;LDA #0;STA C+1;RTS
5230.TERN;LDA S+17;CMP #128;BCS T1;RTS
5250.T1;AND #127;STA S+17;JRR H;T.LDA #1;STA F1;RTS
5270.H1;LDA #0;STA S+1;STA S+3;STA S+14;STA S+15;RTS
5410J1NEXT

```

[illegible]

```

49PROCLD:PRINT"Now enter lines of DATA starting with
lines 2,4,...and ending with DATA100":STOP
50IFIX<=&1300 IX=&1300
51REPEAT:INPUT"Start address for sprite data="DX
52UNTILDX>=IX ANDDX<8170: SX=DX
53REPEAT:INPUT"First sprite no.="DX: UNTILDX>0 ANDDX
<48: DX=DX-1
54CX=0
55RESTORE(2+CX*2): ?(&D41+DX*4)=SX MOD256: ?(&D42+DX*
4)=SX DIV256: BX=SX
60FORNX=0 TO19: READAX: ?(SX+NX)=AX: NEXT
65SX=SX+NX
70READAX: IF AX<256 GOTO80
75?SX=AX MOD256: SX?1=AX DIV256: SX=SX+2: GOTO70
80?(&D40+DX*4)=SX-BX: ?(&D43+CX+DX*4)=1: DX=DX+1: CX=C
X+1: IFAX<>100 GOTO55
90?&D3E=DX: ?&D3F=0
91PRINT"No. of sprites used=": DX
92PRINT"Next free address=": SX

```

```

95PRINT"Now use the following line to SAVE your spr
ites.""*SAVE<filename>' D3E "j~8X'
97STOP
100?&8A=1:?&8F=0:?&8E=1
110MODE2
120?&FE6E=?&1F:?&FE6D=?&EO:?&FE6E=?&EO
130?&FE6B=(?&FE6B)AND&BF
140?&FE6B=0:?&FE69=30
150?&206=?&4F:?&207=?&12
160REPEAT:UNTIL?&D3F=?&D3E ORINKEY(-99)
170?&FE6E=?&FE6E AND127:STOP
180DEFPROCLD
1901Z=?&1300
200REPEAT:PRINT"Loading at ";IZ
210X=OPENUP"":REPEAT:?IZ=BGSET#X:IZ=IZ+1:UNTILEOF#X:C
LOSE#X
220PRINT"Waiting-any key to load more,'@' to stop"
230G=GET:UNTILG=64
240PRINT"Stopped - next address after character dat
a=";IZ
250ENDPROC

```


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FOR SPECTRUM 48K



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CONQUEST A tactical game which even veteran players will find both challenging and rewarding.

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3D BAT ATTACK

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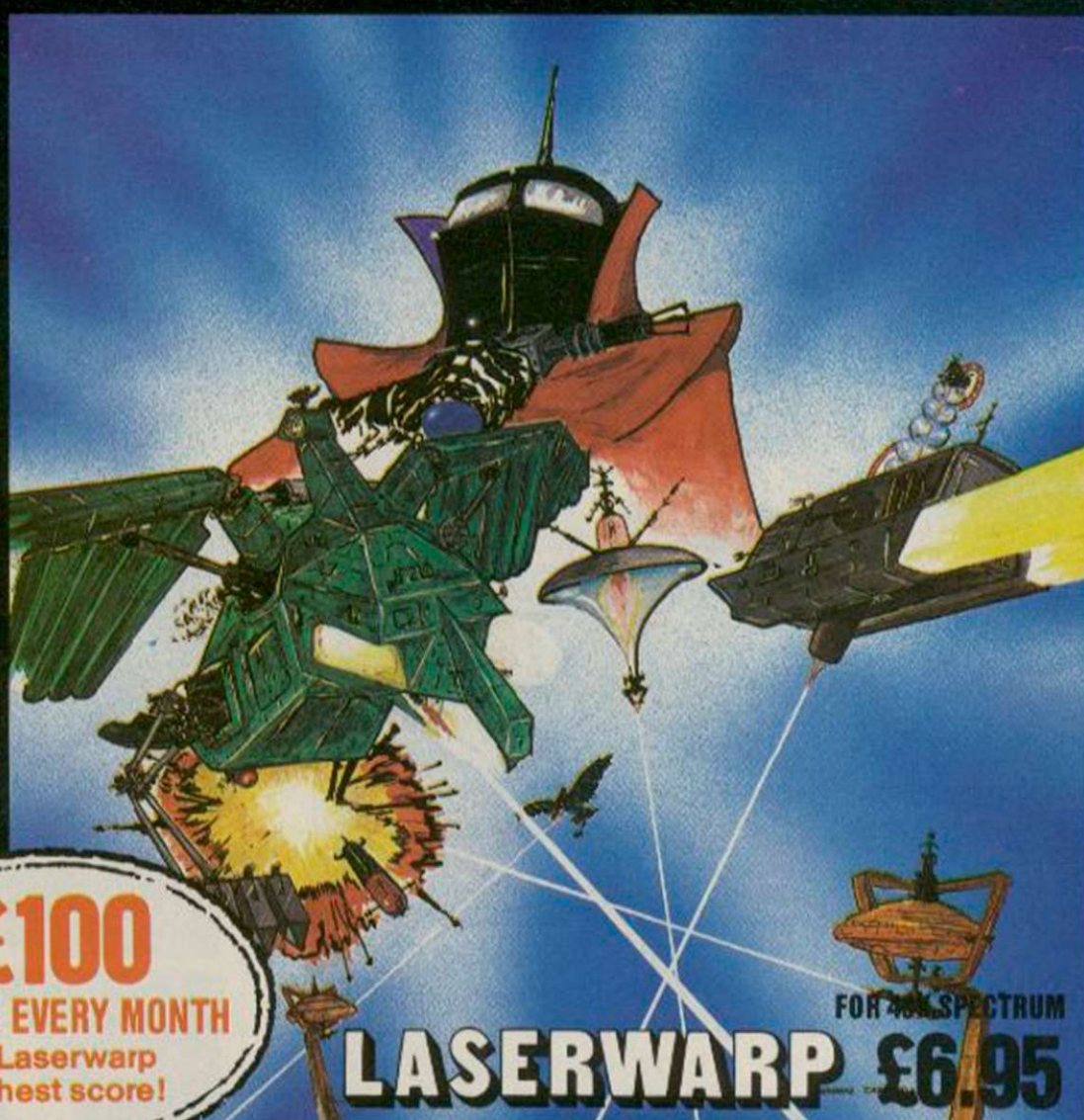
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* Genesis II *

the adventure game that understands plain English!

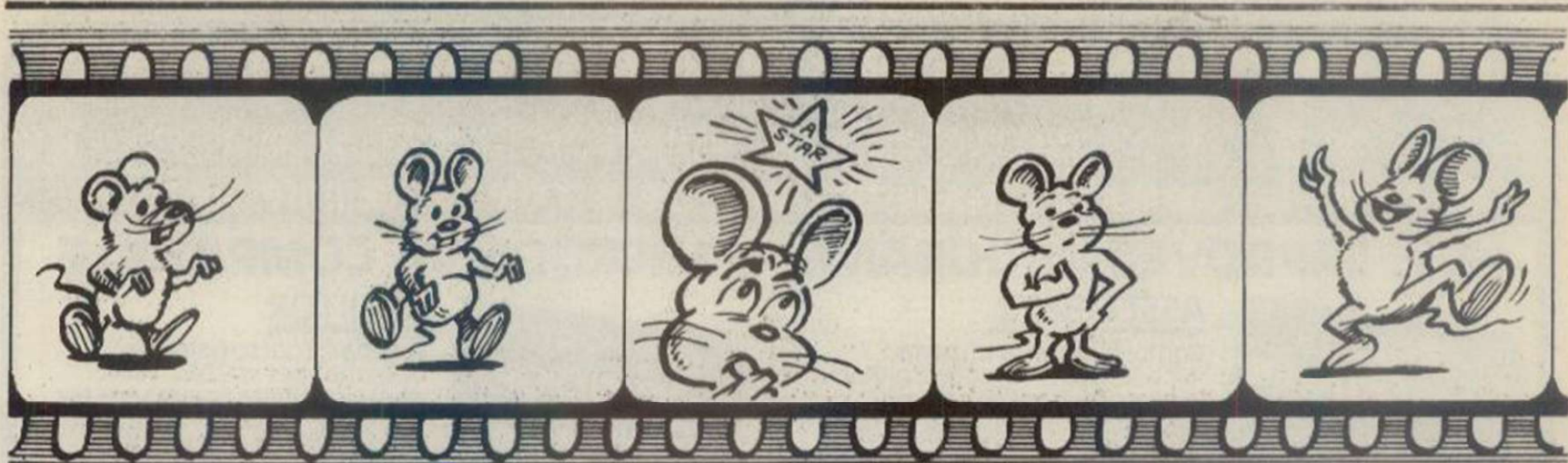
The colony ship Genesis II has been hijacked by space pirates – and you're the only crewman left! Only you can save the cargo – an entire forest, full of animals, destined to populate a new world. This exciting



(Monitor listing continued from previous page)

280	'N	9	0	3	5	7	9
290							
300	'0000		X				
310	'0200	X	X				
320	'0400						
330	'0600	X					
340	'0800		X	X			
350	'0A00	X	X	X			
360	'0C00			X			
370	'0E00	X		X			
380	'1000		X		X		
390	'1200	X	X		X		
400	'1400				X		
410	'1600	X			X		
420	'1800		X	X	X		
430	'1A00	X	X	X	X		
440	'1C00			X	X		

600	'3C00			X	X	X	
610	'3E00	X		X	X	X	
620	'4000		X				X
630	'4200	X	X				X
640	'4400						X
650	'4600	X					X
660	'4800		X	X			X
670	'4A00	X	X	X			X
680	'4C00			X			X
690	'4E00	X		X			X
700	'5000		X		X		X
710	'5200	X	X		X		X
720	'5400				X		X
730	'5600	X			X		X
740	'5800		X	X	X		X
750	'5A00	X	X	X	X		X
760	'5C00			X	X		X
770	'5E00	X		X	X		X



ANIMATOR

THE SAM IN THE Dragon orchestrates the running of the computer. By Poking into the Sam, various effects can be caused outside of the normal design concept of the machine.

The locations 65478 through to 65491 control the video display and by manipulation can extend the usefulness of the Dragon computer by making available more than the one single text page already provided.

The locations in question are paired so that for example 65479, when Poked with any number, switches on while to switch off Poke 65478. This applies to all the locations but, since the screen display for the Dragon starts at address hex 0400, address 65481 is already set. The effect of cancelling the address by Poking

Using the Dragon's SAM chip Derek Gladding produces computer animation.

65480 has the effect of setting the screen start address to 0.

Try this one line program:

10 POKE 65480,0: GOTO 10

You will now see the first 512 locations of the computer displayed on your screen. The other interesting aspect is that these locations are shown in real time ie, while the computer is still running and therefore any update of these locations is displayed before your eyes. You

might like to press the keys to see the effect.

Now try this short program:

10 POKE 65480,C: POKE 65479,0: SKIPF

If you insert one of your Basic game tapes into your cassette and run this program you will observe the incoming program entering the cassette buffer. To show the use to which this facility can be used I have included two programs. The first is a monitor of the full Dragon memory which is controlled by the + and - keys to increase or decrease through the memory.

Appended to this program is a list of screen start addresses and the relevant addresses to be Poked. These locations can be used in one line

(continued on page 129)

Listing 1.

```
10 PCLEARB: CLEAR200,32600
20 DATA "1",0,"2",1,"3",2,"4",3,"Q",4,"W",5,"E",6,"R",7
,"A",8,"S",9,"D",10,"F",11,"Z",12,"X",13,"C",14,"V",15
30 CLSO
40 GOSUB950
50 EXEC32745
60 PRINT@44B,"INSTRUCTIONS (Y/N)"
70 A$=INKEY$
80 IFA$="Y" THEN GOSUB1450:GOTO100:ELSE IFA$="N" THEN 100
90 GOTO70
100 CLSO
110 OP=&H0600:CO=128:CU=1
120 POKE&H302,&H06:POKE&H303,0:EXEC32630
130 PO=OP
140 BA=PEEK(PO)
150 POKEPO,CU
160 FORT=1 TO 50:NEXTT
170 POKEPO,BA
180 FORT=1 TO 30:NEXTT
190 CLSO
200 A$=INKEY$:IFA$="" THEN 150
210 IFA$=CHR$(94) THEN PO=PO-32
220 IFA$=CHR$(95) THEN PO=PO-128
230 IFA$=CHR$(10) THEN PO=PO+32
240 IFA$=CHR$(91) THEN PO=PO+128
250 IFA$=CHR$(9) THEN PO=PO+1
260 IFA$=CHR$(93) THEN PO=PO+4
270 IFA$=CHR$(8) THEN PO=PO-1
280 IFA$=CHR$(21) THEN PO=PO-4
290 IFPO<OP THEN PO=OP
300 IFPO>OP+&H1FF THEN PO=OP+&H1FF
310 IFA$="M" GOSUB1760
320 IFA$="I" GOSUB1450:GOSUB1090
330 IFA$=CHR$(75) GOSUB1290
340 IFA$<>CHR$(12) THEN 480
350 PRINT@44B,"COLOUR NO. OR r TO RETURN"
360 C$=INKEY$:IFC$="" THEN 360
370 IFC$="R" THEN GOSUB1080:GOTO470
380 IFC$="C" THEN 390 ELSE 360
390 CL=VAL(C$):IFCL=0 THEN CL=128:GOTO410
400 CL=CL*16+127
```

```
410 POKE32601,CL
420 B$=HEX$(OP)
430 IFLEN(B$)<4 THEN B$="0"+B$
440 B=VAL("&H"+LEFT$(B$,2))
450 POKE32603,B:POKE32608,B+2
460 EXEC32600
470 GOSUB1080
480 IFA$="" GOSUB1100:GOSUB1080
490 IFA$<>"+" THEN 510 ELSE OP=OP+&H200:IFOP=&H3600 THEN
NOP=&H600:POKE&H302,&H34
500 CU=CU+1+(CU=24)*24:GOTO520
510 IFA$<>"-" THEN 570 ELSE OP=OP-&H200:CU=CU-1+(CU=1)*
24:IFOP=&H400 THEN NOP=&H3400:POKE&H302,&H06
520 B$=HEX$(OP)
530 IFLEN(B$)<4 THEN B$="0"+B$
540 B=VAL("&H"+LEFT$(B$,2))
550 POKE&H302,B
560 GOSUB1080:GOTO130
570 IFA$<>"P" THEN 660
580 OP=&H600:POKE&H302,&H06:PRINT@44B,"PRESS LAST PAGE
LETTER"
590 TW$=INKEY$:IFTW$="" THEN 590 ELSE TW=ASC(TW$)-64
600 IFTW<1 OR TW>24 THEN 590
610 PRINT@44B,"SELECT SPEED (1 TO 9)"
620 SP=VAL(INKEY$):IFSP<1 OR SP>9 THEN 620
630 CLSO
640 FORDE=1 TO SP*40:NEXTDE:GOSUB1080:OP=OP+&H200:POKE
&H302,PEEK(&H302)+2:IF OP=&H600+(&H200*TW) THEN 650 ELSE
640
650 FORDE=1 TO 2000:NEXTDE:GOTO110
660 IFASC(A$)>32 ANDASC(A$)<41 THEN CO=(ASC(A$)-32)*16
+112
670 FORT=1 TO 16
680 READZ$,Z:IFZ$=A$ THEN POKEPO,CO+Z:PO=PO+1:GOTO690:ELSE
NEXT
690 RESTORE
700 IFA$=CHR$(63) GOSUBB10
710 IFA$<>"*" THEN 700 ELSE TW=&H600:TW=&H400:L=1
720 FORT=0 TO 31:POKETW+T,PEEK(ST+T):NEXT
730 PRINT@96,"DATA--LINE NO.":L
740 FORT=0 TO 31:PRINTPEEK(ST+T):NEXT
```

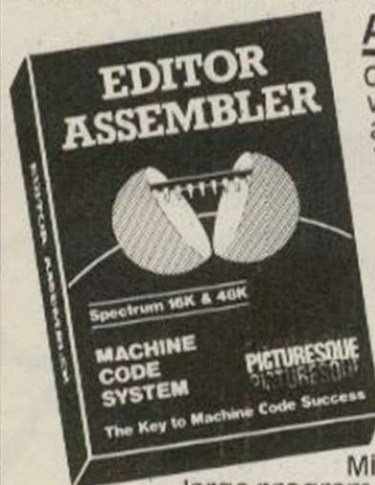
(listing 1 continued on page 129)

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CLOCK digital clock
CURSOR CONTROL CODES allow strings to have complex shapes
DEF KEY user definable keys
DELETE a block of lines
DO-LOOP structure
DPOKE double poke
EDIT specified line
ELSE (used with IF... THEN)
EXIT leave DO-LOOP

FILL enclosed area with specified ink or paper
GET wait for keypress
JOIN two program lines
KEYIN a string
KEYWORD new keywords on/off
LISTLIST line TO line
USED (used with GOTO, GOSUB)
ON ERROR trap errors (with LINE, STAT and ERROR)
PLOT a string (may contain cursor control codes)
POKE a string
POP Basic's stack
PROC, DEF PROC, END PROC (for named procedures)

RENUM versatile renumber
ROLL all or part of screen in any direction by specified number of pixels, with or without attributes
SCROLL like ROLL, but without wrap-around
SORT arrays (very fast)
SPLIT program lines
TRACE program execution
UNITS used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
XDS, YDS move PLOT origin
XRG, YRG change PLOT scale

FUNCTIONS

AND (bit-by-bit)
BNE decimal to binary
CHARS number to 2 characters
CODE fast code
DEC hexadecimal to decimal
DPEEK double PEEK
FILLED filled area

HEX8 decimal to hexadecimal
INSTR string search
MEM free memory
MEMORY# all of memory as a string
MOD modulus
NUMBER 2 characters to number
OR (bit-by-bit)

RND8 fast RND
SCREEN recognises user graphics
SNE fast sine
STRINGS repeats strings
TIMES current time
USING# formats numbers
XOR (bit-by-bit)

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(continued from page 127)

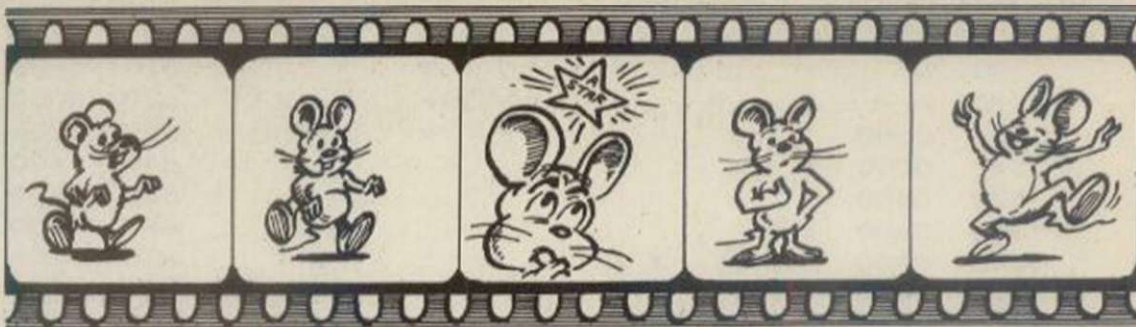
programs as the previous examples show, but if used within a program they would have to be reset to return to the text screen.

The simple way to reset any of the addresses is to insert the command Print. The second program uses the same routine to switch pages but converted to machine code in order to prevent screen flashing when the screen addresses are incremented in quick succession.

The Dragon graphics pages have been used to provide 24 text pages. The program contains many commands which are listed for reference at any time during operation. With these 24 pages available you now have the means to store information such as spreadsheet type data and, as suggested with the program title, cartoon animation.

In brief the facilities provided with the program are as follows:

- Direct entry to the screen of any of the Dragon graphic characters by selected keys, as detailed in the instructions.
- Graphic colours can be changed at any time using Shift and the appropriate colour number.
- By pressing the Dragon abbreviated print symbol ? you enter the text mode which gives you a choice of normal or reverse field writing



on all characters.

- The screen can be cleared to any colour using the clear key followed by the colour number.
- Elaborate introductory program pages can be designed and saved from within the program as a machine-code file.
- Pages of graphics can be copied to any other page so that complicated pictures do not have to be redrawn when working on animations.
- Any size of graphics block can be marked and repositioned on the screen.
- Each page has its own cursor code letter.
- The cursor can be moved anywhere on the screen using the arrow keys. If greater cursor movement is required using the shift key will move the cursor four squares at a time in the appropriate direction.
- Any animations can be saved to tape

● If you require to draw out small sections of graphics, such as large letter titles, then you can select the graphic data for any line down of the first page.

● To see your pictures come to life, by pressing P, you can play them on your screen

● As in the monitor program, by pressing the + or - keys you may flick through the pages to view your work.

In order to make use of your title pages, save the screen picture to tape immediately prior to your program for which it was designed. To load your program into the computer from tape you will need a Basic line:

10 CLOADM : CLOAD.

When you run this line your title page will be displayed on the screen while the rest of the program is loading.

(listing 1 continued from page 127)

```

750 PRINT:PRINT:PRINT"PRESS '+' FOR NEXT LINE OR r TO
RETURN"
760 E$=INKEY$:IFE$="" THEN760
770 IFE$="R" THEN800
780 IFE$(">"+) THEN760
790 L=L+1:ST=ST+32:IFST<>H800 THEN 720
800 GOSUB1080:GOTO140
810 PRINT@448,STRING$(32,143);
820 PRINT@448,;
830 LINEINPUT"MESSAGE:-";M$
840 PRINT@448,"NORMAL/REVERSE FIELD (N/R)";:INPUTTY$
850 GOSUB1080
860 IFTY$="N" THENTY=64:GOTO870 ELSEIFTY$="R" THENTY=6
3 ELSE840
870 FORT=1 TO LEN(M$)
880 IFTY=64 THEN900
890 POKEPO,ASC(MID$(M$,T,1))ANDTY:GOTO910
900 POKEPO,ASC(MID$(M$,T,1))ORTY
910 PO=PO+1
920 NEXT
930 TY=0
940 RETURN
950 DATA&H000,65491,&H4000,65489,&H2000,65487,&H1000,
65485,&H800,65483,&H200,65479
960 READZ$,Z:IFZ=15 THEN970 ELSE960
970 FORT=1 TO 6:READA(T),B(T):NEXT
980 DATA&B,8F,8E,04,00,A7,80,8C,06,00,26,F9,39,8E,06,0
0,10,8E,04,00,A6,80,A7,A0,8C,08,00,26,F7,39
990 DATA7F,FF,D2,7F,FF,D0,7F,FF,CE,7F,FF,CC,7F,FF,CA,7
F,FF,C9,7F,FF,C6,FC,03,02,10,83,80,00,25,06,83
1000 DATA&B,00,7F,FF,D3,10,83,40,00,25,06,83,40,00,7F,
FF,D1,10,83,20,00,25,06,83,20,00,7F,FF,CF,10,83,10,00,
25,06,83,10,00,7F,FF,CD,10
1010 DATA&B,08,00,25,06,83,08,00,7F,FF,CB,10,83,04,00,

```

```

26,03,7F,FF,C7,10,83,02,00,26,06,7F,FF,C7,7F,FF,CB,10,
83,00,00,26,03,7F,FF,C8,39
1020 DATA&B,80,80,10,8E,06,00,AF,A1,10,8C,36,00,26,FB,
39,END
1030 M=32600
1040 READA$:IFA$="END" THEN1060 ELSEPOKEM,VAL("&H"+A$)
1050 M=M+1:GOTO1040
1060 RESTORE
1070 RETURN
1080 EXEC32630
1090 RETURN
1100 PRINT@352,"PRESS:-          T SAVE TITLE PAGE
          A SAVE ANIMATIONS      L LOAD PICTURES
          R RETURN"
1110 E$=INKEY$
1120 IFE$="T" THEN1130 ELSEIFE$="A" THEN1190 ELSEIFE$=
"L" THEN CLOADM:RETURN: ELSEIFE$="R" THENRETURN ELSE11
10
1130 PRINT@448,"SELECT RECORD & PRESS ENTER"
1140 IFINKEY$(<>CHR$(13)) THEN1140
1150 POKE32614,&H06:POKE32625,&H08:POKE32618,&H04
1160 EXEC32613
1170 CSAVEM"INTRO",&H400,&H5FF,&H400
1180 RETURN
1190 PRINT@448,"PRESS LAST PAGE LETTER"
1200 TW$=INKEY$:IFTW$="" THEN1200 ELSETW=ASC(TW$)-64
1210 IFTW<1 ORTW>24 THEN1200
1220 PRINT@448,"SELECT RECORD & PRESS ENTER"
1230 IFINKEY$(<>CHR$(13)) THEN1220
1240 CSAVEM"ANIMATE",&H600,TW*&H200+&H600,&H600
1250 RETURN
1260 A$=INKEY$:IFA$="" THEN1260
1270 PRINT@,ASC(A$)
1280 GOTO:260

```

(listing 1 continued on next page)

Monitor listing

```

10 CLS
20 DATA&H000,65491,&H4000,65489,&H2000,
65487,&H1000,6
5485,&H800,65483,&H200,65479
30 GOSUB110
40 FORT=1 TO 6:READA(T),B(T):NEXT
50 A$=INKEY$
60 IFA$="+" THENOP=OP+&H200:GOSUB90
70 IFA$="-" THENOP=OP-&H200:GOSUB90
80 GOTO50
90 IFOP<0 THENOP=&HFE00
100 IFOP>&HFE00 THENOP=0
110 PRINT@0,"NEXT PAGE STARTS AT &H"HEX$(OP)
120 FORD=1 TO 500:NEXT
130 NP=OP:FORT=1 TO 5:IFNP<A(T)
THEN NEXT ELSENP=NP-A(

```

```

T):POKEB(T),0:NEXT
140 IFNP=&H600 THENPOKE65479,0
150 IFNP=&H200 THENPOKE65479,0:POKE65480,0
160 IFNP=0 THENPOKE65480,0
170 RETURN
180 '
190 '
200 'arrangement of pokes for
      selected screen addresses
210 '
220 '
230 'S
240 'C P      6      6      6      6      6      6
250 'R A      5      5      5      5      5      5
260 'E G      4      4      4      4      4      4
270 'E E      7      8      8      8      8      8

```

(Monitor listing continued on next page)

(Monitor listing continued from previous page)

```

280 'N      9      0      3      5      7      9
290 -----
300 '0000      X
310 '0200    X    X
320 '0400
330 '0600    X
340 '0800      X    X
350 '0A00    X    X    X
360 '0C00      X
370 '0E00    X    X
380 '1000      X      X
390 '1200    X    X      X
400 '1400      X
410 '1600    X      X
420 '1800      X    X    X
430 '1A00    X    X    X    X
440 '1C00      X    X
450 '1E00    X      X    X
460 '2000      X      X
470 '2200    X    X      X
480 '2400      X
490 '2600    X      X
500 '2800      X    X    X
510 '2A00    X    X    X    X
520 '2C00      X    X
530 '2E00    X      X    X
540 '3000      X      X    X
550 '3200    X    X      X    X
560 '3400      X    X
570 '3600    X      X    X
580 '3800      X    X    X    X
590 '3A00    X    X    X    X    X

```

```

600 '3C00      X    X    X
610 '3E00    X      X    X    X
620 '4000      X
630 '4200    X    X
640 '4400
650 '4600    X
660 '4800      X    X
670 '4A00    X    X    X
680 '4C00      X
690 '4E00    X      X
700 '5000      X      X
710 '5200    X    X      X
720 '5400      X
730 '5600    X      X
740 '5800      X    X    X
750 '5A00    X    X    X    X
760 '5C00      X    X
770 '5E00    X      X    X
780 '6000      X      X    X
790 '6200    X    X      X
800 '6400      X
810 '6600    X      X
820 '6800      X    X    X
830 '6A00    X    X    X    X
840 '6C00      X    X
850 '6E00    X      X    X
860 '7000      X      X    X
870 '7200    X    X      X
880 '7400      X    X    X
890 '7600    X      X    X
900 '7800      X    X    X    X
910 '7A00    X    X    X    X
920 '7C00      X    X    X

```

(listing 1 continued from previous page)

```

1290 PRINT@448,;:INPUT"FROM PAGE ";ST#
1300 ST=ASC(ST#)-64
1310 IFST<1 ORST>24 THEN1290
1320 PRINT@448,;:INPUT" TO PAGE ";TW#
1330 TW=ASC(TW#)-64
1340 IFTW<1 ORTW>24 THEN1320
1350 ST# =HEX$(ST#&H200)&H400)
1360 TW# =HEX$(TW#&H200)&H400)
1370 IFLEN(ST#)<4 THENST#="0"+ST#
1380 IFLEN(TW#)<4 THENTW#="0"+TW#
1390 ST=VAL("&H"+LEFT$(ST#,2))
1400 TW=VAL("&H"+LEFT$(TW#,2))
1410 POKE32614,ST:POKE32625,ST+2:POKE32618,TW
1420 EXEC32613
1430 GOSUB1080
1440 RETURN
1450 CLS0
1460 PRINT@0,"'s' = SHIFT";
1470 PRINT@14
1480 PRINT@64," ARROWS-----MOVE CURSOR
1490 PRINT@128,"'s'+ARROWS-----EXTRA MOVEMENT"
1500 PRINT@192,"'CLEAR'-----CLEAR SCREEN"
1510 PRINT@256,"'K'-----TO COPY PAGES"
1520 PRINT@320,"'?'-----ENTER WRITTING
1530 PRINT@384,"'SPACE'-----LOAD OR SAVE SCREENS"
1540 PRINT@448,"'s'+ NO.-----CHANGE COLOUR SET
1550 GOSUB1720
1560 CLS0
1570 PRINT@14
1580 PRINT@64,"'I'-----FOR INSTRUCTIONS";
1590 PRINT@128,"'P'-----DISPLAY FILM
1600 PRINT@192,"'+'OR'-----TO TURN THE PAGES
1610 PRINT@256,"'+'-----TO PRINT LINE DATA
FROM FIRST PAGE ONLY";
1620 PRINT@352,"'M'-----TO MOVE BLOCKS OF GRAPHI
CS,POSITION THE CURSOR AT THE TOP LEFT & THEN BOTTOM R
IGHTOF THE BLOCK & PRESS 'm' IN EACHPOSITION.";
1630 GOSUB1720
1640 CLS0:PRINT@14
1650 PRINT@64,"TO ENTER GRAPHICS USE THE BLOCK OF 16 K
EYS:- '1' TO '4' ACROSS '1' TO 'Z' DOWN IN THE ORDER
AS SHOWN IN THE GRAPHIC CHARACTER SECTION OF THE DRAGO
N MANUAL."
1660 PRINT@260,"1";CHR$(128)CHR$(128);:PRINT@267,"2"CH
R$(128);CHR$(177);:PRINT@274,"3"CHR$(128)CHR$(178);:PR
INT@281,"4"CHR$(128)CHR$(179);
1670 PRINT@324,"Q"CHR$(128)CHR$(180);:PRINT@331,"W"CHR
$(128)CHR$(181);:PRINT@338,"E"CHR$(128)CHR$(182);:PRIN
T@345,"R"CHR$(128)CHR$(183);

```

```

1680 PRINT@388,"A"CHR$(128)CHR$(184);:PRINT@395,"S"CHR
$(128)CHR$(185);:PRINT@402,"D"CHR$(128)CHR$(186);:PRIN
T@409,"F"CHR$(128)CHR$(187);
1690 PRINT@452,"Z"CHR$(128)CHR$(188);:PRINT@459,"X"CHR
$(128)CHR$(189);:PRINT@466,"C"CHR$(128)CHR$(190);:PRIN
T@473,"V"CHR$(128)CHR$(191);
1700 GOSUB1720
1710 RETURN
1720 PRINT@14,;:INPUT"PRESS 'ENTER'";E#;IFE#="" THEN R
ETURN ELSE1720
1730 GOSUB1080
1740 CLS0
1750 RETURN
1760 MO=MO+1
1770 IFMO=1 THENBL=BA:PL=PD:POKEPD,35:RETURN
1780 BR=BA:PR=PD:MO=0:POKEPD,35
1790 POKEPL,BL:POKEPR,BR
1800 IFPR<PL THEN MO=0:RETURN
1810 PRINT@448," r -RETURN OR ARROWS TO MOVE"
1820 E# =INKEY$:IFE#="" THEN1820 ELSEEXEC32630
1830 Y=FIX((PR-PL)/32)
1840 X=PR-(PL+(Y*32))
1850 IFE#="R" THENRETURN
1860 IFE# =CHR$(9) GOSUB1880 ELSEIFE# =CHR$(8) GOSUB1940
ELSE IFE# =CHR$(94) GOSUB2000 ELSEIFE# =CHR$(10) GOSUB2
060 ELSE1820
1870 GOTO1820
1880 FORHO=X TO 0 STEP-1
1890 FORVE=Y*32 TO 0 STEP-32
1900 POKEPL+HO+1+VE,PEEK(PL+HO+VE)
1910 NEXTVE,HO
1920 PL=PL+1:PR=PR+1
1930 RETURN
1940 FORHO=0 TO X
1950 FORVE=Y*32 TO 0 STEP-32
1960 POKEPL+HO-1+VE,PEEK(PL+HO+VE)
1970 NEXTVE,HO
1980 PL=PL-1:PR=PR-1
1990 RETURN
2000 FORVE=0 TO Y*32 STEP32
2010 FORHO=0 TO X
2020 POKEPL-32+VE+HO,PEEK(PL+VE+HO)
2030 NEXTHO,VE
2040 PL=PL-32:PR=PR-32
2050 RETURN
2060 FORVE=Y*32 TO 0 STEP-32
2070 FORHO=0 TO X
2080 POKEPL+32+VE+HO,PEEK(PL+VE+HO)
2090 NEXTHO,VE
2100 PL=PL+32:PR=PR+32
2110 RETURN

```


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SPECTRUM

Program 1.

```
10 POKE 23693,7: POKE 23694,0:
POKE 23697,0: BORDER 0: CLEAR 2
9999: LOAD ""CODE : CLS
20 POKE 32583,1: POKE 32582,1:
POKE 23681,0: POKE 32578,128: P
OKE 32579,88
30 RANDOMIZE USR 30017
40 GO SUB USR 31967: GO TO 40
1000 INPUT "Name ? "; LINE a$: I
F NOT LEN a$ OR LEN a$>10 THEN G
O TO 1000
1010 SAVE a$ SCREEN$: RANDOMIZE
USR 30017: RETURN
1100 INPUT "Name ? "; LINE a$: L
OAD a$ SCREEN$: RANDOMIZE USR 3
0017: RETURN
1200 RANDOMIZE USR 30017: INPUT
AT 0,0: PAPER 6: INK 0: "Text (ma
x. ";INT ((256-PEEK 32578)/8/PEE
K 23728):")",, LINE a$: PRINT ;:
RANDOMIZE USR 31176: REM a$
1210 RANDOMIZE USR 30017: RETURN
```

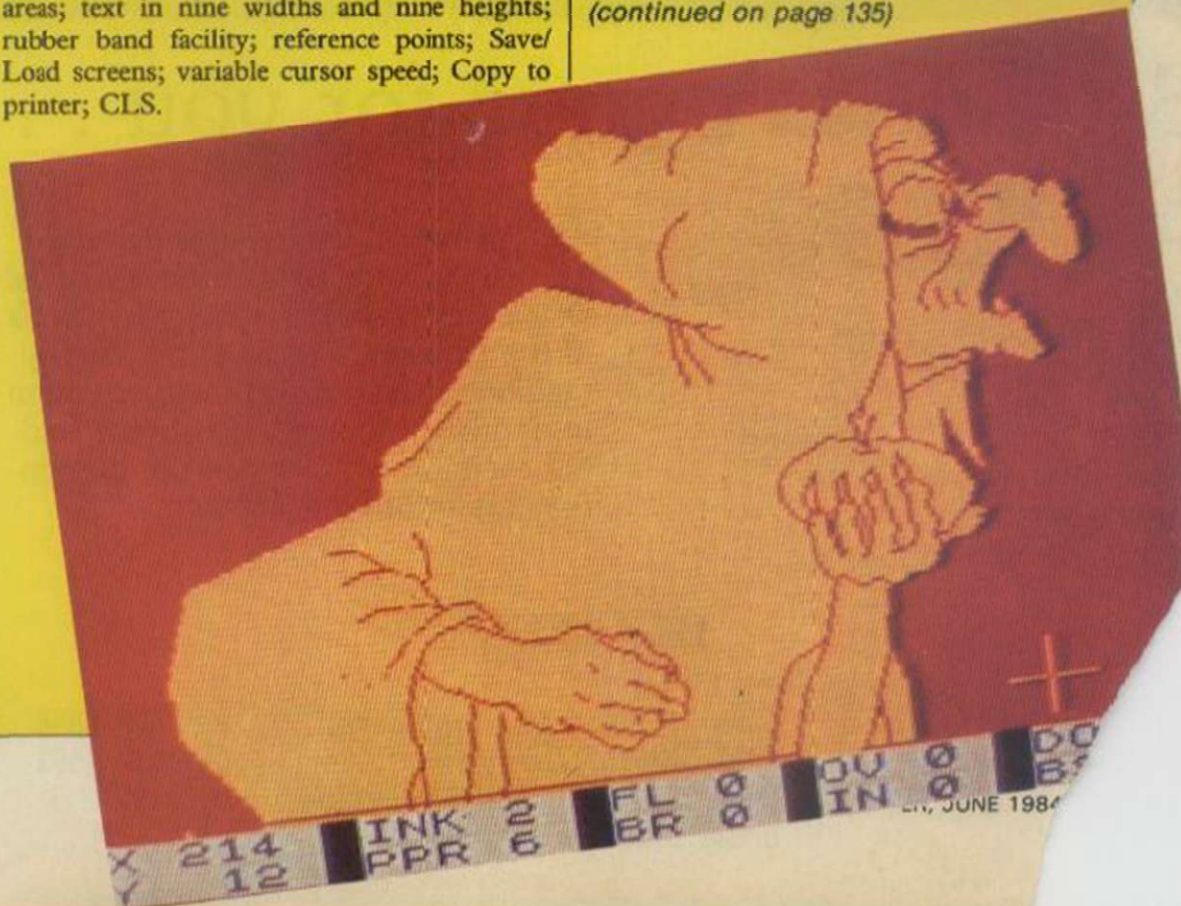
```
3000 LET f=0: GO TO 3020
3010 LET f=1
3020 LET cx=PEEK 32578: LET cy=P
EEK 32579: LET ix=PEEK 32580: LE
T iy=PEEK 32581: LET r=SQR ((cx-
ix)*(cx-ix)+(cy-iy)*(cy-iy))
3030 IF f THEN LET cx=ix: LET cy
=iy
3050 LET ix=cx+r: LET iy=cy: POK
E 32584,ix-256*INT (ix/255): POK
E 32585,128+INT (iy/255): POKE 3
2586,1y: POKE 32587,128
3060 LET s=2*INT (INT (PI*SQR r+
.5)/2)+2: IF s>252 THEN LET s=25
2
3070 FOR n=0 TO 2*PI STEP PI/s
3080 LET x=INT (.5+cx+r*COS n)
3090 LET y=INT (.5+cy+r*SIN n)
3100 RANDOMIZE USR 31526: REM x-
ix,y-iy
3110 LET iy=y: LET ix=x: NEXT n
3120 RANDOMIZE USR 31526: REM cx
+r-ix,cy-iy
3130 RANDOMIZE USR 30017: RETURN
```

DRAW

THIS GRAPHICS program for any ZX Spectrum contains the following facilities: Full control of colours, Flash, Bright, Over and Inverse; Draw lines, boxes and circles using normal or dotted lines and with a choice of nine different line widths. Circles may be partly off screen; fill areas; text in nine widths and nine heights; rubber band facility; reference points; Save/Load screens; variable cursor speed; Copy to printer; CLS.

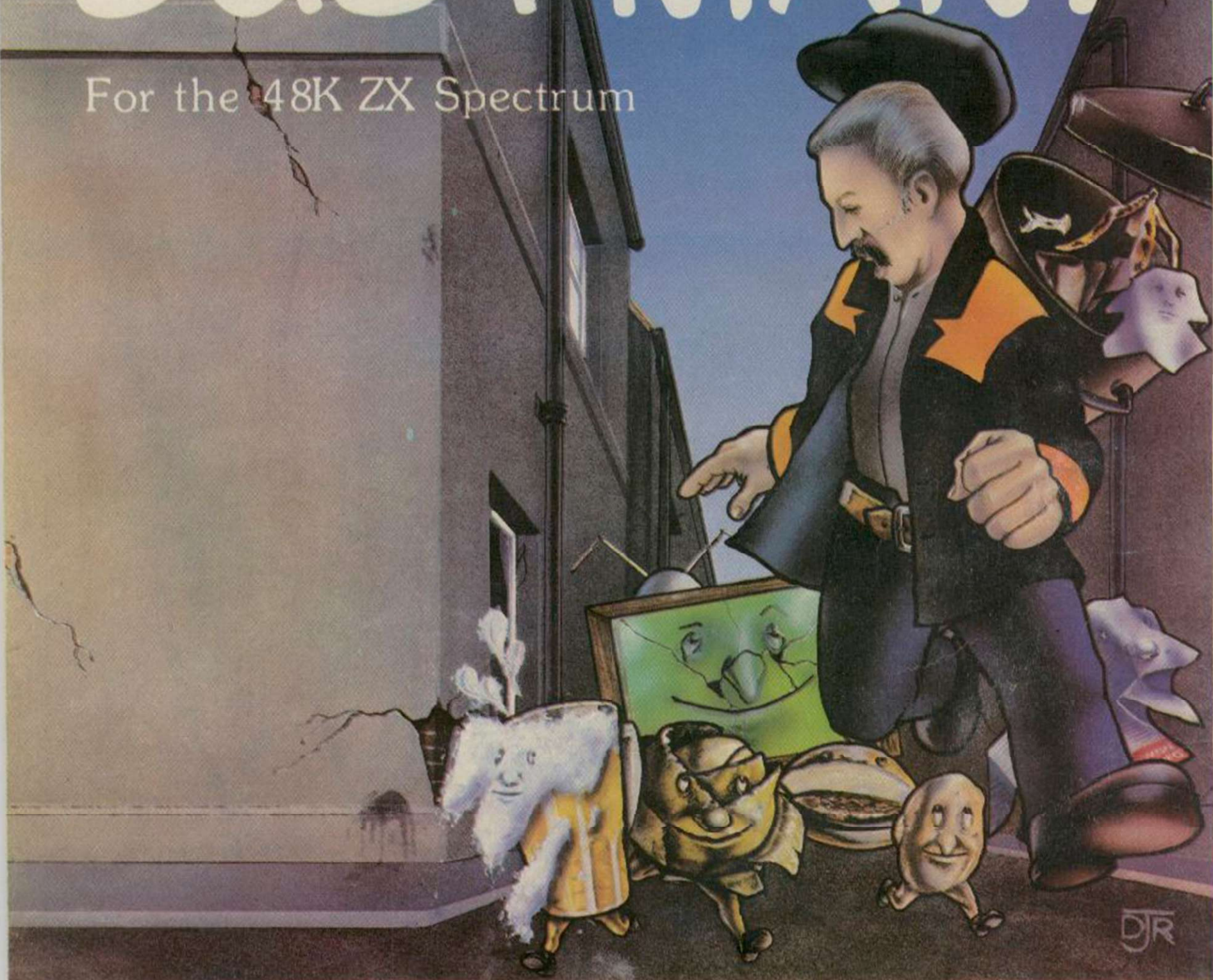
The two bottom lines of the screen give you information on the cursor co-ordinates and the current Ink, Paper, Flash, Bright, Over, Inverse and Dot parameters.

Table 1 lists the keys used and explains how to use them. The program consists of 2050
(continued on page 135)



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Table 1.

5,6,7,8	Cursor keys. Press Caps Shift for greater steps.
0	Plots a dot at the cursor position.
k,l	Make the cursor move faster/slower.
x	Sets Ink colour.
c	Sets Paper colour.
v	Sets Flash parameter.
b	Sets Bright parameter.
n	Changes Over state.
m	Changes Inverse state.
d	Changes Dot state.
z	Copy.
V	CLS. The program will ask "CLS?". Press Y to clear the screen.
s	Save screen to tape.
j	Load screen from tape.

f	Fill.
r	Controls the rubber bands. To switch band no. 2, for example, on/off, press r and then 2.
y	Reference 1. To set the reference point, move the cursor to the desired location and press y. Now, if you press y, the cursor will jump to this point.
u	Reference 2.
p	Sets the brush size (= line width).
t	Print text string at current cursor position. The program will ask for horizontal and vertical size. Note that different brush sizes produce different fonts.
q	This key is used to set the first point when drawing lines,

w	Lines.
i	Boxes. Two diagonally opposite points are needed.
g,h	Both these keys are used to draw circles, and the points needed are the centre and one on the circumference. With g, you set the point on the circumference first, with h, you set the centre first.
o	Sets Border colour.
a	Colour change. This makes the colours the screen colours.

(continued from page 133)

bytes of machine code and a small Basic program which contains routines for loading, saving and circle drawing.

First, type in program 1. Do not run it yet. Save it on tape and type New.

Now enter program 2 and run it. When it has run successfully, type New and enter program 3, which generates the tables used by the program. When it has run, it will save the code.

Rewind the tape, type LOAD "" and try it all out. To turn off the beep, type POKE 30725,201

To stop the program, press j and then Caps Shift and 6. To make it a click, type POKE 30727,0

You can extend the range of commands available by amending the Data statements in program 3. If, for instance, you write a Basic routine at line 5000, and want to allocate it to key c, simply insert e5000 at line 3000, and change the 4 at line 3010 to a 5.



Table 2.

Address		
32578	Co-ordinates of cursor.	32584 Store of co-ordinates. Used by
32580	Co-ordinates of last point — set with q.	32586 off-screen line-drawing routine.
32582	Brush size.	32588 Co-ordinates of first and
32583	Cursor speed.	32590 second reference point.
		32592 Co-ordinates of rubber bands.
		23681 Bit 0: Dot on.
		Bit 1: Dot flag.
		Bits 2-5: Rubber band flags.

Program 2.

```

10 CLEAR 29999: LET p=30000: F
OR 1=1000 TO 1310 STEP 10
20 READ d,a$
30 LET c=0: FOR n=1 TO LEN a$
STEP 2
40 LET a=CODE a$(n)-48: LET b=
CODE a$(n+1)-48
50 LET a=a-39*(a>9): LET b=b-3
9*(b>9): POKE p,16*a+b
60 LET c=c+PEEK p: LET p=p+1
70 NEXT n: PRINT 1: " ": IF c<
>d THEN PRINT "error": STOP
80 PRINT "OK": NEXT 1
1000 DATA 6929,"ed437d5ccdaa2247
043e010f10fdae77c9ed4b427f79d60a
3801afc6145f79c60a4f30057b915f0e
ffc5cd3075c10d1d20f7ed4b427f78d6
0a3801afc6145f78"
1010 DATA 6672,"c60a473eaf903004
B35f06afcdad2247043e010f10fd434f
7ea977cd687610f806043a815c1f1f21
507fc5e51ff5dca975f1e1c1232310f2
c75e23562a427f22"
1020 DATA 6352,"7d5c7a940e013004
7c920eff47517b950e0130047d930eff
594fb8300669d5af5f1807b1c86841d5
160060781f853803bc3807944fd9c1c5
18044fd5d9c12a7d"
1030 DATA 7199,"5c78844779854fcd
3075d97910afd1215827d9c9ed437d5c
3a467ffe02301121815c7ecb472806ee
0277e602c8c3e5225f6fcb3f57799230
03835faf4f789230"
1040 DATA 6776,"03856faf47556369
fdcb5786e5c5d5cd0f76d1c10c28031d
20f3e14d5c0478feb030031520e62191
5ccb4ec8cb6c90000000000000000000

```

```

247ce607c07dc620"
1050 DATA 9208,"6fd87cd60867c7cb
422804a7c83dc9d608d0afc9cb422804
3cc03dc9c608d03effc9ed4b427f3efe
dbfe573ef7dbfecb6779cc77764f3eef
dbfe5fcb6378cc77"
1060 DATA 8329,"7647cb5b78cc8476
feb038023eaf47cb5379cc84764f2a42
7f3ebfdbfe5f3a477fcb4bcc8476cb53
cc777632477fa72809c547c510fec110
fac1ed42c809c5cd"
1070 DATA 7557,"41753eefdbfe1fed
4b427fd40476e122427fcd4175188bc5
cdad2247043e010f10fda6c1c9c5d501
0500cd051fd1c1c9ed4b427fcd0777c0
c5214677ef53601"
1080 DATA 7315,"21815c7ef5cb8621
915c7ee6fa7701fff5c5ed4b427fcd07
7720070ced43427f20f01100000ded43
427fc5d5cd0476d1c178feaf28207ba7
200c04cd07772006"
1090 DATA 5289,"cd1577c51e0led4b
427f7b3d200804cd077728021e00ed4b
427f78a728207aa7200c05cd07772006
cd1577c516017a3d200ced4b427f05cd
077728021e00ed4b"
1100 DATA 7417,"427f79a7280a0ded
43427fcd0777289ae122427f24c24277
2cc24277f132815cf132467fe122427f
c9d5012117cdd90dd1affd365530fd77
56c3227dfdc016e"
1110 DATA 8519,"28fa3a085cfdcb01
aec9cdec77d63038f9fe0a30f5f1132
00210001c0db503f1c9cdec77d63138f9
3cfe0a30f418e6cdec77d63038f9fe02
38dbfe0820f118d5"
1120 DATA 6210,"42414e44204e4f2e
2028312d3429203fa0112f78cdd977cd

```

```

ec77d63138f9fe0430f5cd0578114e7f
3c473e0207131310fb21815c4fae77a1
c82a427feb732372"
1130 DATA 7136,"c9cd4d0dfdcdb57d6
012118cdd90d3e58d73a427fcd627911
4d79cd3f793a8d5ce607ee30fcdcb5446
28023e38fcdcb576e28023e39d7114e79
cd3f793a8d5c07e6"
1140 DATA 6884,"01ee30fcdcb547e28
023e38d7115179cd3f793a915ce6020f
ee30d7115379cd3f793a815ce601ee30
d73e20d73e59d73a437fcd6279115579
cd3f793a8d5c0f0f"
1150 DATA 6554,"0fe607ee30fcdcb54
5e28023e38fcdcb577e28023e39d71158
79cd3f793a8d5c0707e601ee30fcdcb54
7628023e38d7115b79cd3f793a915c0f
0f0fe601ee30d711"
1160 DATA 7767,"5d79cd3f793a467f
ee30d73e20d7c93e20d73e8fd7afcd0a
0c3e20d7c980494ecb46cc4fd6444fd4
5050d242d249ce4253a05f1600d5c32c
1afd5e76fd567761"
1170 DATA 7736,"6be5c5d5cd0476d1
c10c1d20f5e14c5d05783cc81520eac9
1608cb13d5c5dc6979c1d1fd7e7681d8
4f1520eac92a365cfe8038052a7b5cd6
90eb6f2600292929"
1180 DATA 8176,"1916085ee5d5c5cd
8879c1d1e178fd9677d847231520ecc9
dfe5e7e7cddb228ed4b427f235e231c1d
281723d5e5c57ecd9d79c1e1d1fd7e76
0707078138034f18"
1190 DATA 4526,"e6e1c3780080494e
4b2028302d392920bf50415045522028
302d392920bf464c4153482028302c31
2c382920bf4252494748542028302c31

```

(Program 2 continued on page 137)

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(Program 2 continued from page 135)

```

2c382920bf120143"
1200 DATA 5213,"4c533fbf424f5244
45522028302d372920bf42525534820
53495a452028312d39293fa011f579cd
d977cdfa7757377a0607380507070706
384f7a218d5cfe08"
1210 DATA 6761,"79380a7e2807b02f
e624280178cd6c223e07ba7fcd6c2223
23070707e6a0c3672211f679cdd977cd
fa7757a718c111017acdd977cd1f780f
5f0680218d5cdd6c"
1220 DATA 6673,"227b0f0f0fc36c22
110e7acdd977cd1f780f0f5f0640218d
5cdd6c227b0f0f0fc36c2221915c7eee
0277c921915c7eee0877c9111d7acdd9
77cdd977cd0578fe"
1230 DATA 8282,"59ca6b0dc921815c
3e01ae77c9112d7acdd977cdd977cd630
38f9fe0830f5cd0578c39b2211347acd

```

```

d977cd117832467fc9ed43447fc9dfe5
e7e7cd7a1ccd0723"
1240 DATA 6288,"e1225d5c79b83006
69c5af5f1807b1c86841d5160060781f
853803bc3807944fd9c1c518044fd5d9
c12a487f79a72806233d28022b2b2248
7fe52a4a7f78a728"
1250 DATA 5960,"06233d28022b2b22
4a7fd13e80bc200dba200a7dfcb03005
454bcd0476d97910b7f1215827d9c92a
447fed43447f3e8032497f324b7f7d32
487f7c324a7f1601"
1260 DATA 8182,"5a789430u47c9016
ff47799530047d911eff4fc3347b2a44
7fe5c544cd977bc1c5cd977bc1e1e5c5
4dcd977bc1c1c3977b21c05011c1503e
10011f0070e5d5ed"
1270 DATA 8222,"b0d1e108cd6876eb
cd6876eb083d20e921c05a11c15a3630
013f00edb0c97e23bbc807d8232318f6
cd7178fdbc309e2a8d5cbfcd5b0da7fd

```

```

cb016efdcdb01aec8"
1280 DATA 5833,"fd5ece21f47ecd0e
7c283721327dcd0e7c3fd0e5cd0578cd
4175e14e234637c9484f522e2053495a
452028312d392920bf5645522e205349
5a452028312d3929"
1290 DATA 8546,"20bf7bfe742020cd
e17b114f7cdd977cd117832b05c1150
7cdd977cd117832b15c01b00437c9fe
30f5e5c40578cd4175e15e2356cb7acb
bad5c4e17be1ed4b"
1300 DATA 6600,"427fcd2c16cd4175
f128063a045c3c20faa7c92a4c7f2242
7fc92a427f224c7fc92a4e7f22427fc9
2a427f224e7fc93e01cd0116cd9276cd
4d0cd187c30f5c9"
1310 DATA 7619,"210058ed5b8d5c01
c0027eaba2abfdbc577e2808e6c7cb57
2002ee38fdbc576e2808e6f8cb6f2002
ee0777230b78b120d9c921915cbb86cb
96cd0a0cfc35e0d"

```

Program 3.

```

3000 DATA "g3000","h3010","j1100
","s1000"
3010 LET p=32050: FOR n=1 TO 4:
READ a$: POKE p, CODE a$: LET a=V
AL a$(2 TO )
3020 POKE p+1,a-256*INT (a/256):
POKE p+2,INT (a/256): LET p=p+3
: NEXT n: POKE p,128
4000 DATA 4178,"07604 f7720 rf84
1 xfa54 cfa91 vfa9e bfab8 n7ad3
m7adb Vfae3 d7af5 ofafd"
4010 DATA 2890,"z0eac t0000 pfb1
4 q7b21 w7b97 i7bc6 y7cc3 Y7cca
u7cd1 U7cd8 a7cf0 "+CHR$ 128+"00
00"
4050 LET p=32500

```

```

4060 FOR n=1 TO 2
5000 READ t,a$: LET c=0
5010 POKE p, CODE a$
5020 POKE p+1,16*(CODE a$(4)-48-
39*(a$(4)>"9"))+CODE a$(5)-48-39
*(a$(5)>"9")
5030 POKE p+2,16*(CODE a$(2)-48-
39*(a$(2)>"9"))+CODE a$(3)-48-39
*(a$(3)>"9")
5040 LET c=c+PEEK (p+1)+PEEK (p+
2): LET p=p+3: LET a$=a$(7 TO ):
IF LEN a$ THEN GO TO 5010
5050 PRINT 3990+n*10;: IF c<>t T
HEN PRINT " error": STOP
5060 PRINT " OK": NEXT n
6000 SAVE "mc"CODE 30000,2600

```

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Addictive

* ZX81 Chart
Home Computing Weekly 212/84

Comments about the game from press and our customers

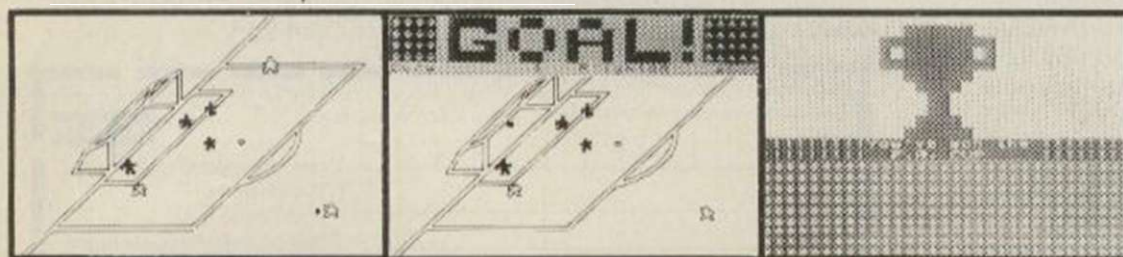
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THINGS TO DO WITH YOUR VIC

WE ALL KNOW that Commodore produces some of the best computers by far, but also that the documentation which accompanies them falls to a much lower standard. So here are a few bits and pieces gathered together from many different sources which may help you on your way to making the perfect program.

It is split up into four sections as follows:

- Special effects with the Super Expander.
- Some interesting Peek locations.
- Hi-res with a joystick on the unexpanded Vic.
- Bits and pieces.

VIC-20 + SUPER EXPANDER
SPECIAL EFFECTS: With the Super Expander, one of the extra commands is Circle. When the computer comes across this command with all of its parameters, it draws a circle. But how does it find out and plot the points? This program finds out the next point and joins it to the previous one by using the Draw command. Changing the .1's in line 30 can have some interesting effects.

```
1 INPUT R
10 GRAPHIC 2
20 POINT2,512+(R*.7),512
30 FOR H=0 TO 2*pi+.1 STEP .1
40 FOR X=(R*COS(H)*.7:Y=R*SIN(H)
50 DRAW2 TO X+512,Y+512
60 NEXT H
```

● Here is a second circle program. The only difference is that the Point command is used

instead of Draw, and line 30 is slightly changed.

```
1 INPUT R
10 GRAPHIC 2
30 FOR H=0 TO 2*pi+.1 STEP .03
40 FOR X=(R*COS(H)*.7:Y=R*SIN(H)
50 POINT2,X+512,Y+512
60 NEXT H
70 END
```

● The program right, short though it may be, can draw some very good 3-D pictures. Changing the Sin in line 30, to a Cos will turn the drawing upside down. Changing the value of

Andrew Bacon cobbles together a number of useful facilities for you to try out on your Vic-20.

100 in line 30 will change the steepness of the hills.

```
10 GRAPHIC2:COLOR2,2,1,5
20 FOR A=0 TO 470 STEP 15
30 B=SIN((A)/50)*100
40 CIRCLE2,512,B+500,A,A
50 NEXT
60 END
```

● Do you know about Graphic 4? You don't? Well then I'll tell you about it. After turning the Vic-20 on, you are told that you have 6519 bytes free. But once you've typed a Super Expander command you only have 3069 bytes free left. Where have they all gone to?

This is one of the failings of the Super Expander, but to solve it, type

GRAPHIC 4

and press Return. Then type
PRINT FRE(0)

and press Return. You should now have all your memory back.

Never type Graphic 4 before Graphic 1, 2 or 3 have been used. If you do, the computer will crash and any program in memory will be lost.

● Anyone with a Super Expander will of course know how to plot pixels by using the extra commands. Not everyone though knows how to unplot them. I have therefore written a short program to show this, which is under the explanation of how to unplot pixels.

To draw a circle you may type:

CIRCLE 2,512,512,320,460

Then to unplot it you would type:

CIRCLEOVER 2,512,512,320,460

It is not really important what the word or character is after the command Circle, as long as it is not another system command, ie:

CIRCLETAB 2,512,512,320,460

is incorrect.

CIRCLE X2,512,512,320,460

is correct.

You can also unplot with Draw and Point.

DRAW 2,0,0 TO 1023,1023

draws a diagonal line.

DRAW Z2,0,0 TO 1023,1023

will unplot it.

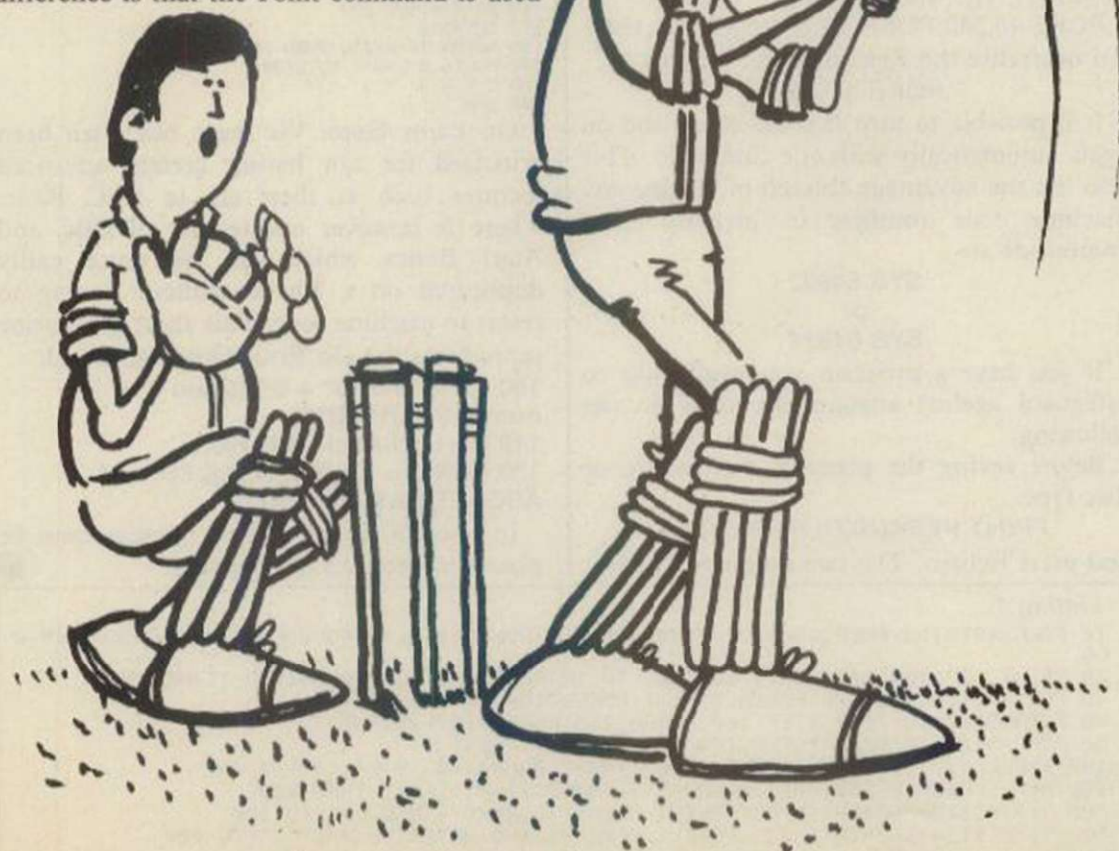
POINT 2,512,512

plots a point in the middle of the screen.

POINT F2,512,512

will unplot that point.

(continued on next page)



(continued from previous page)

```
10 COLOR2:6,5,6
20 GRAPHIC2
30 CIRCLE2,565,465,345,465
40 DRAW 2,360,100 TO 765,100 TO 765,610 TO 360,610
50 REGION5:PRINT2,430,210
60 FOR Q=200 TO 0 STEP -6
70 CIRCLE2,560,360,Q,7,0:NEXT Q
80 CIRCLE2,560,360,50,60
90 REGION7:PRINT2,560,360
100 REGION3:PRINT2,565,800:PRINT2,565,70:REGION6
110 DRAW2,200,0 TO 200,930 TO 930,930 TO 930,0
120 PRINT2,0,0
130 COLOR2:6,2,2:FOR T=0 TO 200:NEXT:COLOR1:6,
1,1:FOR T=0 TO 200:NEXT:GOTO 130
```

PEEK LOCATIONS: The following Peek locations may be of some help towards solving your problems. It is not possible to change the contents of these locations because they are checked by the computer every few tenths of a second. The contents of the locations can be read by using the command Print Peek (location). Next to each location number there will be an explanation of the number returned by the above command.

PEEK(17): This location returns a number which corresponds to the last Input, Read, or Get statement. It tells you which one it last came across in the program.

Input=0. Read=152. Get=64.

PEEK(57) and PEEK(58): These two locations work together to produce a total number which is where the program in memory was either stopped or ended. Both locations must be read to get the correct number. Take the value of location (58) and times it by 256, then add to this the value of location (57) ie:

If PEEK(57)=124 and PEEK(58)=21 then you are on line 5500. Because $(21*256)+124=5500$.

PEEK(63) and PEEK(64): These locations return the line number of the current Data statement being read. They work in the same way as (57) and (58).

PEEK(69) and PEEK(70): The values held in these locations correspond to the last variable name used. If the last variable used was A then the value of location (69) will be 65. The second location is used only if the variable was a two lettered variable, ie:

If the last variable used was BZ then PEEK(69)=66. PEEK(70)=90.

Refer to the CHR\$ table on pages 146-147 of the Vic-20 User Manual for all the correct codes.

PEEK(152): This returns a number which refers to how many files are open at that present time. A value of one is added every time a file is opened, and a value of one is taken away every time a file is closed.

PEEK(214): This returns a number which tells you what row the cursor is on at that present moment. This location can be changed to move the cursor around.

PEEK(215): This location contains the ASCII value of the last key pressed.

PEEK(642): This location returns a number which when multiplied by 256 will give the start of memory location.

PEEK(644): This location returns a number which when multiplied by 256 will give the end of memory location.

PEEK(650): This is the key repeat control area. It can be changed to either 0 or 255. 0=cursor keys repeat only.

255=all keys repeat.

PEEK(646): This location contains the cursor colour value. When Poked with a

number between 0 and 7 inclusive the cursor just changes colour. If the number is higher than 7 then the cursor goes into multicolour mode.

PEEK(657): This location can be changed to either 0 or 128. It controls the Shift/Commodore keys, and therefore the ability to change from upper to lower case and vice versa.

0=enabled change.

128=disabled.

PEEK(36864): Changing the value held in this location enables you to move the screen from left to right and right to left. The normal value here is 12.

PEEK(36865): This holds the value of the vertical position of the screen. Normal value is 37.

PEEK(37159) and PEEK(36967): Both these locations do the same. They change the speed of the cursor. The higher the value Poked in, the slower the cursor will flash, but the programs will run faster.

PEEK(36867): The screen will either lengthen or shorten depending on the value held in this memory location.

PEEK(36870) and PEEK(36871): These two locations hold the values for the position of a light-pen. They hold the X and Y values respectively.

PEEK(36872) and PEEK(36873): These two locations hold the values for the paddles. Two paddles may be connected, and both their values are read here.

JOY DRAW: The program in listing 1 allows you to draw in high resolution by using a joystick, on the unexpanded Vic-20.

Line 10: Sets the screen size to 16 by 10, and changes the screen and border colour. Lines 20-50: Set up the screen for use and draw a box around it to limit the area which can be used.

Line 100: Converts the joystick port values to X and Y values.

Line 200: This allows the point to move. Lines 500-600: These lines calculate and plot the point.

BITS 'N' PIECES: To neutralise the Run Stop key, type the following

```
POKE 45,240:POKE 46,26:POKE 788,194
To neutralise the Restore key, type this
POKE 37150,3
```

It is possible to turn the Vic-20 off and on again automatically with one command. This also has the advantage though of leaving any machine code routines in memory. The commands are

```
SYS 64802
or
SYS 64824
```

If you have a program you would like to safeguard against anyone else then do the following:

Before saving the program on cassette or disc type:

```
PRINT PEEK(4097),PEEK(4098)
```

and press Return. The two numbers which it

gives you must be noted down or memorised as they will be needed on loading the program.

Now type:

```
POKE 4097,0:POKE 4098,0
```

and press Return. The program will now not list or run, although it is still in memory. Now save the program as usual and don't forget those numbers. When you want to load the program, do so as usual and then type the following using X and Y as the numbers you memorised.

```
POKE 4097,X:POKE 4098,Y
```

and press Return. The program will now run and list etc...

If you are bored of playing space invaders the normal way round try putting something like this in the program. It automatically gives you a totally new game. You're playing upside down. Type in the program on its own and see what you think.

Once it's been run it can be Newed and to go back to upside down mode again just type

```
POKE 36869,253
```

and press Return.

```
2 POKE36869,253
5 FOR I=0TO2048 STEP 8
10 FOR Q=0 TO 7
20 POKE5120+Q+1,PEEK(32775+I-Q)
30 NEXTQ,I
```

AUTO BLEEP: This program is for the unexpanded Vic-20. It is designed to give a bleep whenever a key is pressed. The machine code routine is called by the IRQ interrupt every one sixtieth of a second. This is achieved by altering the IRQ jump address stored at locations 788 and 789.

To get rid of the bleep press the Run-Stop and Restore keys together. To restore the bleep type:

```
SYS 673
```

and press Return.

```
10 X=673
20 DATA120,169,174,141,20,3,169,2,141,21,3,88,96
30 DATA165,203,281,64,240,25,169
40 DATA5:REM VOLUME
50 DATA141,14,144,169
60 DATA246:REM NOTE
70 DATA141,11,144,162,55,160
80 DATA255:REM LENGTH
90 DATA136,208,253,202,208,248,169,0,141,11,144
100 DATA169,1,141,139,2
110 DATA76,191,234
120 DATA256
130 READA:IF A=256 THEN 150
140 POKEA,A:X=X+1:GOTO130
150 SYS 673
160 NEW
```

On Error Goto: Vic Basic has often been criticised for not having certain advanced features such as there are in BBC Basic. There is however one feature of BBC and Atari Basics which can be quite easily duplicated on a Vic-20 without having to resort to machine code. This short subroutine reproduces the On Error Goto command:

```
100 AS="GOTO"+STR$(line
number)+CHR$(13)
110 L=LEN(AS):POKE 198,L
120 FOR A=1 TO L:POKE 630+A,
ASC(MID$(AS,A)):NEXTA
```

In line 100 an actual line number must be placed in between the brackets.

Listing 1.

```
10 POKE36879,13:POKE36867,21:POKE36864,17:POKE36865,45:POKE36866,144:POKE36869,2
53
20 PRINT "J":FOR A=1 TO 16:FOR N=1 TO 10:POKE7663+16*N+A,N+10*A-11:NEXTN,A
30 FOR A=5120 TO 7679:POKEA,0:NEXT:POKE37154,127:X=64:Y=80
40 FORA=5120 TO 7679 STEP 160:POKEA,255:POKEA+159,255:NEXT
50 FORA=5121 TO 5278:POKEA,128:POKEA+2400,1:NEXT
100 A=PEEK(37151):X=X+(AND16)=0:Y=Y+(AND4)=0:Y=Y-(AND8)=0
200 X=X-(PEEK(37152)AND128)=0:F=-((AND32)=0):IFF=1 THEN 600
500 Y1=Y+5120+160*INT(X/8):POKEY1,PEEK(Y1)OR2*(7-XAND7):GOTO 100
600 Y1=Y+5120+160*INT(X/8):POKEY1,PEEK(Y1)AND NOT2*(7-XAND7):GOTO 100
```


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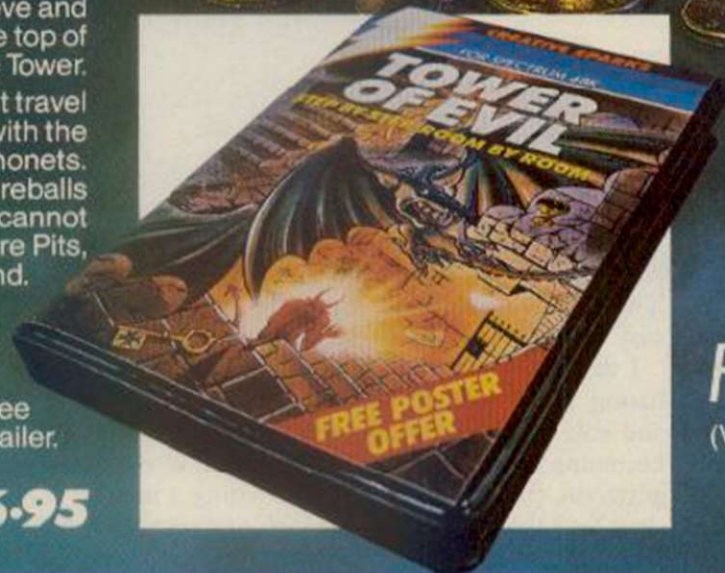
To collect the treasure, Andros must travel from room to room, duelling with the Demi-Clones, wrestling with the Baphonets. To defend himself, Andros can throw fireballs from his fingertips, but even this skill cannot help him negotiate the dreaded Fire Pits, which must be leaped in a single bound.

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CREATIVE SPARKS



DRAGON K

John Nash raises the chequered flag on a fast machine-code racing game.

Listing 1.

[illegible]

I HAVE BEEN SURPRISED at the apparent lack of car simulators for the Dragon. True, there are a number of race-circuit programs, but I have yet to see one which gives you the driver's view through the windscreen. I adopted the principle: "If the program you want does not exist, write it yourself", and set to work.

The assembler routine to move the display was the first and most important task, and after experimenting with a high resolution routine — listing 2 — I decided this was too slow, although it did produce a very nice display.

The hex dump and Basic driver are included in case any readers want to experiment with it.

I then wrote a text screen display routine — listing 1 — which is very much faster, and able to take a variable delay loop without becoming absurd! To load this version of the program, first type in the Basic listing 1 and then Save this to tape or disc *without* trying to Run it. If you Run it, it will crash due to calling non-existent code routines. Next, type New, and then load the hexadecimal bytes from the hex dump. A suitable loader is:

```
10 FOR N = &H7000 TO &H71A3:READA$:
POKEN,VAL("&H" + A$):NEXT
20 DATA C5.45.8E.5.60 etc
```

for as many data statements as you need. It is often convenient to put 10 bytes in a line as in the hex dump. Next do a:

CSAVEM"CODE",&H7000,&H71A3,1
to store the code on tape. Now you can reload
the Basic program and Run to start it. Future
loading can be done by loading the code and
Basic programs in either order from the tape,
(continued on page 145)

ART

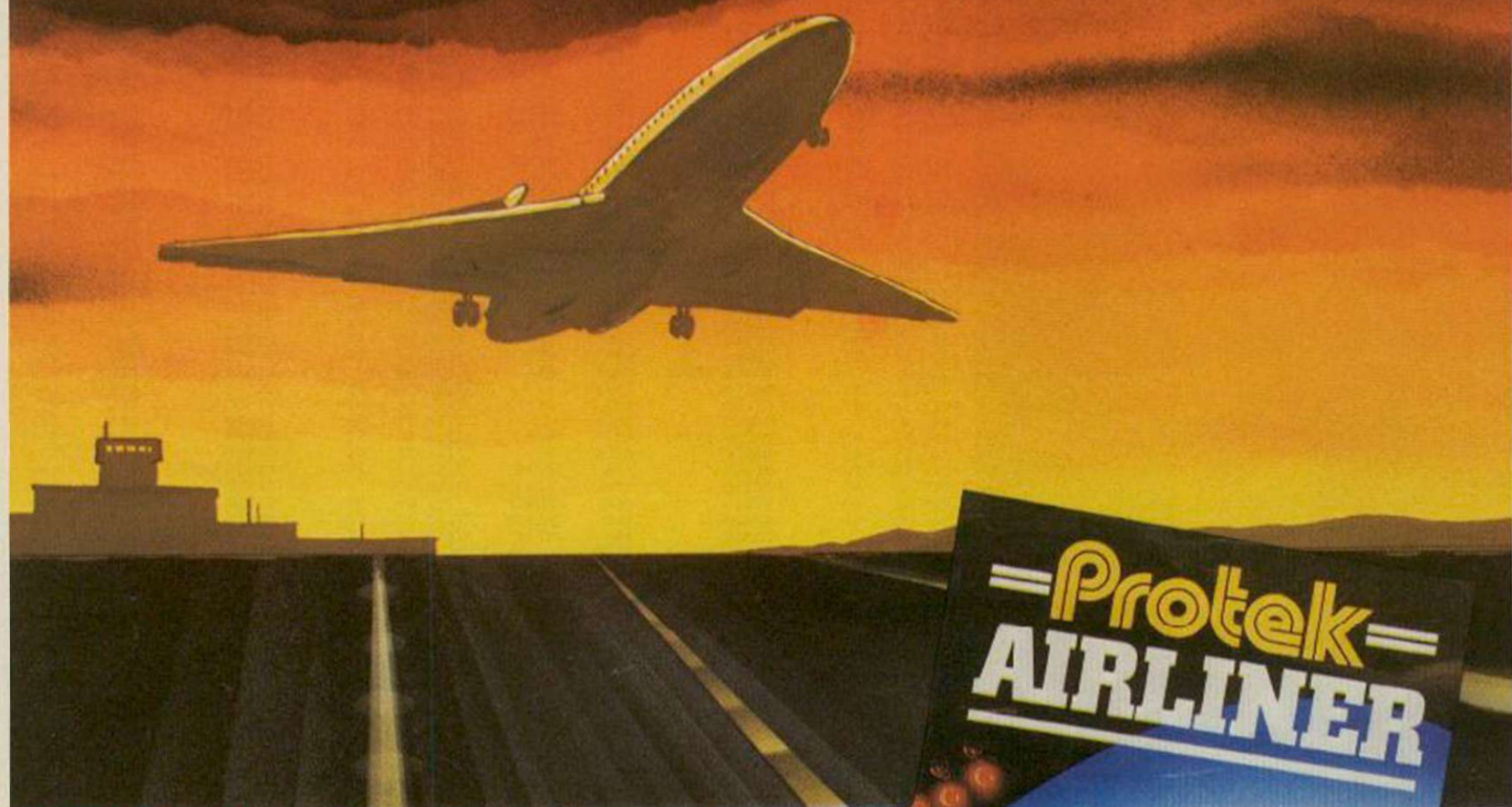
Assembler dump of listing 1.

7000	0088	00100	ORG	\$7000	70C5 C1	05	01140	CHPR	#5
	0084	00110	CL	EQU	136	70C7 25	06	01150	RLO
		00120	CR	EQU	132	70C9 C0	05	01160	LOUT
7000		00130	FLAG1	RMB	1	70CB 96	78	01170	SURR
7001		00140	FLAG2	RMB	1	70CD A7	85	01180	#5
	70	00150	SETDP	\$70	70CF 16	FF30	01190	LDA	WLINE
7002 8E	0560	00160	START	LDX	#1376	70D2 34	14	01200	STA
7005 108E	0580	00170	LDY	#1408	70D4 34	04	01210	PSHS	R,X
7009 5F		00180	LOOP1	CLRR		70D6 C0	0A	01220	PSHS
700A 0F	00	00190	CLR	FLAG1		70D8 86	8F	01230	SURR
700C 0F	01	00200	CLR	FLAG2		70DA 50		01240	LDA
700E A6	85	00210	LOOP0	LDA	B,X	70DB 27	05	01250	STB
7010 0D	00	00220	TST	FLAG1		70DD A7	80	01260	BEQ
7012 26	0E	00230	BNE	ROAD		70DF 5A		01270	STA
7014 81	88	00240	CHPA	#CL		70E0 26	FR	01280	DECR
7016 27	14	00250	REQ	LEDGE		70E2 86	88	01290	RNE
7018 0D	01	00260	TST	FLAG2		70E4 A7	80	01300	LDA
701A 26	43	00270	BNE	KCOPY		70E6 86	80	01310	STA
701C 81	80	00280	CHPA	#128		70E8 C6	08	01320	LDA
701E 27	02	00290	REQ	ROAD		70EA A7	80	01330	LDL
7020 20	31	00300	BRA	LCOPY		70EC 5A		01340	STA
7022 0C	00	00310	ROAD	INC	FLAG1	70ED 26	FR	01350	DECR
7024 81	84	00320	CHPA	#CR		70EF 86	84	01360	BNE
7026 27	16	00330	REQ	REDGE		70F1 A7	80	01370	LDA
7028 A7	A5	00340	STA	B,Y		70F3 35	04	01380	STA
702A 20	38	00350	BRA	NEXT		70F5 86	8F	01390	PULS
702C 5D		00360	LEDGE	TSTB		70F7 A7	80	01400	LDA
702E 34	04	00370	PSHS	B		70F9 5C		01410	STA
702F 27	01	00380	REQ	SKIP		70FA C1	20	01420	INCR
7031 5A		00390	DECB			70FC 25	F9	01430	CHPR
7032 A7	A5	00400	SKIP	STA	B,Y	70FE 35	14	01440	BLO
7034 35	04	00410	PULS	B		7100 C0	05	01450	R,X
7036 86	80	00420	LDA	#128		7102 96	78	01460	SURR
7038 A7	A5	00430	STA	B,Y		7104 A7	85	01470	LDA
703A 0C	00	00440	INC	FLAG1		7106 16	FEF9	01480	STA
703C 20	29	00450	BRA	NEXT		7109 34	14	01490	PSHS
703E C1	1F	00460	REDGE	CMPR	#31	710B 34	04	01500	PSHS
7040 34	04	00470	PSHS	B		710D C0	0A	01510	SURR
7042 24	01	00480	BHS	SKIP2		710F 86	8F	01520	LDA
7044 5C		00490	INCB			7111 A7	80	01530	STA
7045 A7	A5	00500	SKIP2	STA	B,Y	7113 5A		01540	DECR
7047 35	04	00510	PULS	B		7114 26	FB	01550	RNE
7049 86	80	00520	LDA	#128		7116 86	88	01560	LDA
704B A7	A5	00530	STA	B,Y		7118 A7	80	01570	STA
704D 0F	00	00540	CLR	FLAG1		711A 86	80	01580	LDA
704F 0C	01	00550	INC	FLAG2		711C 35	04	01590	PULS
7051 20	14	00560	BRA	NEXT		711E A7	80	01600	STA
7053 5D		00570	LCOPY	TSTB		7120 5C		01610	INCB
7055 34	04	00580	PSHS	B		7121 C1	28	01620	CMPR
7057 27	01	00590	REQ	SKIP3		7123 23	F9	01630	BLS
7059 A7	A5	00600	DECB			7125 35	14	01640	PULS
705B 35	04	00610	SKIP3	STA	B,Y	7127 C1	24	01650	CMPR
705D 20	08	00620	PULS	B		7129 22	06	01660	BHI
705F C1	1F	00630	BRA	NEXT		712B C0	05	01670	ROUT
7061 24	04	00640	RCOPY	CMPR	#31	712D 96	78	01680	SURR
7063 5C		00650	BHS	NEXT		712F A7	85	01690	LDA
7065 A7	A5	00660	INCB			7131 16	FECE	01700	STA
7067 5C		00670	STA	B,Y		7133 C6	27	01710	ORHS
7069 5A		00680	DECB			7136 D7	7A	01720	STB
706B C1	1F	00690	NEXT	INCB		7138 86	8F	01730	LDA
706E 23	A2	00700	CMPR	#31		713A A7	80	01740	STA
7070 30	88 80	00710	BLS	LOOP0		713C 8C	04RD	01750	CMPL
7072 31	A8 80	00720	LEAX	-32,X		713F 23	F9	01760	RLS
7074 8C	04A0	00730	LEAY	-32,Y		7141 86	88	01770	LDA
7076 24	92	00740	CMPL	#1184		7143 A7	80	01780	STA
7078 16	00D2	00750	BHS	LOOP1		7145 86	80	01790	LDA
707A		00760	LBRA	WHITEL		7147 A7	80	01800	STA
707B		00770	JSTORE	RMB	1	7149 16	FEF6	01810	LBRA
707C C6	70	00780	WLINE	RMB	1	714C D6	78	01820	WHITEL
707E 1F	98	00790	CHOOSE	LDB	#570	714E C1	82	01830	CMPL
7080 D6	7A	00800	TFR	B,DP		7150 27	06	01840	BLACK
7082 8E	04A0	00810	LDB	JSTORE		7152 C6	82	01850	LDB
7084 C1	03	00820	LDX	#1184		7154 D7	78	01860	STB
7086 25	0F	00830	CMPL	#3		7156 20	04	01870	BRA
7088 C1	0A	00840	RLO	OLHS		7158 C6	80	01880	BLACK
708A 25	1F	00850	CMPL	#10		715A D7	78	01890	STB
708C C1	1F	00860	RLO	LMS		715C 5F		01900	WOUT
708E 25	41	00870	CMPL	#31		715D 1F	98	01910	TFR
7090 C1	27	00880	RLO	MID		715F 39		01920	RTS
7092 25	74	00890	CMPL	#39		7160 8E	0400	01930	SSTORE
7094 16	009C	00900	RLO	RHS		7163 108E	7400	01940	LDY
7096 86	80	00910	LBRA	ORHS		7167 A6	80	01950	SSLOOP
7098 A7	80	00920	OLHS	LDA	#128	7169 A7	A0	01960	STA
709A 86	8F	00930	STA	,X+		716B 8C	0600	01970	CMPL
709C 86	8F	00940	LDA	#132		716E 25	F7	01980	RLO
709E A7	80	00950	STA	,X+		7170 39		01990	RTS
70A0 86	8F	00960	LDA	#143		7171 8E	0400	02000	SCREEN
70A2 A7	80	00970	STA	,X+		7174 108E	7400	02010	LDY
70A4 8C	04C0	00980	CMPL	#1216		7178 A6	A0	02020	SCLOOP
70A6 25	F9	00990	BLO	LOOP10		717A A7	80	02030	STA
70A8 16	FF56	01000	LBRA	START		717C 8C	0600	02040	CMPL
70AA 34	14	01010	LHS	PSHS	B,X	717F 25	F7	02050	BLO
70AC 5A		01020	DECB			7181 39		02060	RTS
70AE 86	80	01030	LDA	#128		7182 8E	0400	02070	CSTORE
70B0 A7	80	01040	STA	,X+		7185 108E	7600	02080	LDY
70B2 5A		01050	DECB			7189 A6	80	02090	CSLOOP
70B4 26	F8	01060	BNE	LOOP11		718B A7	A0	02100	STA
70B6 86	84	01070	LDA	#132		718D 8C	0600	02110	CMPL
70B8 A7	80	01080	STA	,X+		7190 25	F7	02120	RLO
70BA 86	8F	01090	LDA	#143		7192 39		02130	RTS
70BC A7	80	01100	STA	,X+		7193 8E	0400	02140	CWRITE
70BE 8C	04C0	01110	CMPL	#1216		7196 108E	7600	02150	LDY
70C0 25	F9	01120	RLO	LOOP2		719A A6	A0	02160	CWLOOP
70C2 35	14	01130	PULS	B,X		719C A7	80	02170	STA
						719E 8C	0600	02180	CMPL
						71A1 25	F7	02190	RLO
						71A3 39		02200	CODEND
							0000	02210	END

Hex dump for listing 1.

28672	C5 45 8E 5 60 10 8E 5 80 5F	28802	8E 4 A0 C1 3 25 F C1 A 25	28942	A 86 8F A7 80 5A 26 FB 86 88
28682	F 0 F 1 A6 85 D 0 26 E	28812	1F C1 1F 25 41 C1 27 25 74 16	28952	A7 80 86 80 35 4 A7 80 5C C1
28692	R1 89 27 14 D 1 26 43 81 80	28822	0 9C 86 80 A7 80 86 84 A7 80	28962	28 23 F9 35 14 C1 24 22 6 C0
28702	27 2 20 31 C 0 81 84 27 16	28832	86 8F A7 80 8C 4 C0 25 F9 16	28972	5 96 7B A7 85 16 FE CE C6 27
28712	A7 A5 20 38 5D 34 4 27 1 5A	28842	FF 56 34 14 5A 86 80 A7 80 5A	28982	D7 7A 86 8F A7 80 8C 4 8D 23
28722	A7 A5 35 4 86 80 A7 A5 C 0	28852	26 FB 86 84 A7 80 86 8F A7 80	28992	F9 86 88 A7 80 86 80 A7 80 16
28732	20 29 C1 1F 34 4 24 1 5C A7	28862	8C 4 C0 25 F9 35 14 C1 5 25	29002	FE 86 D6 7E C1 82 27 6 C5 82
28742	A5 35 4 86 80 A7 A5 F 0 C	28872	6 C0 5 96 7B A7 85 16 F7 30	29012	D7 7B 20 4 C6 80 D7 7B 5F 1F
28752	1 20 14 5D 34 4 27 1 5A A7	28882	34 14 34 4 C0 A 86 8F 5D 27	29022	98 39 8E 4 0 10 8E 74 0 A6
28762	A5 35 4 20 8 C1 1F 24 4 5C	28892	5 A7 80 5A 26 FB 86 88 A7 80	29032	80 A7 A0 8C 6 0 25 F7 39 8E
28772	A7 A5 5A 5C C1 1F 23 A2 30 88	28902	86 80 C6 8 A7 80 5A 26 7B 86	29042	4 0 10 8E 74 0 A6 A0 A7 80
28782	E0 31 A8 E0 8C 4 A0 24 92 16	28912	84 A7 80 35 4 86 8F A7 30 5C	29052	8C 6 0 25 F7 39 8E 4 0 10
28792	0 D2 FF FF C6 70 1F 9B D6 7A	28922	C1 20 25 F9 35 14 C0 5 96 7B	29062	8E 76 0 A6 80 A7 A0 8C 6 0
		28932	A7 85 16 FE F9 34 14 34 4 C0	29072	25 F7 39 8E 4 0 10 8E 76 0
				29082	A6 A0 A7 80 8C 6 0 25 F7 39

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(continued from page 142)

and then typing Run.

The right-hand joystick gives steering control, moving the road in the correct sense, i.e., opposite to the stick. If you have a 100K ohm potentiometer with a knob that twists, this would give a more realistic control movement.

Your accelerator and brakes are controlled by the left-hand joystick, forwards to go faster, backwards to slow down. In the exact central position, you will coast. Don't worry if you don't have joysticks, as you can control the program from the keyboard. The listing below shows which lines to add/alter, and you will then use the arrow keys for turning and speed control. The shift key gives a sharper turn. You will probably also want to alter line 250 — instructions — to read more appropriately.

On both versions of the program, the kart has a very flexible engine, giving you a speed range of 8-100 mph with no gear changes. You will find that the faster you go, the less cornering ability you have, so you may well crash off the side of the road, to the accompaniment of a suitable display and sound.

Also, your fuel will only get you to the end if you drive at a moderate speed. Watch the fuel gauge. When you crash, stall or finish, you are given a readout of distance and time. Should you actually finish, you will see a chequered flag and hear a suitable tune.

You can design your own course by altering the data statements in lines 120-170, and adding more if necessary. Value 0 gives straight ahead, +1 to +3 gives various degrees of right turn — 3 is the most — and -1 to -3 various degrees of left turn. Do not exceed 3 either way, as your kart cannot turn more sharply than that. When you have put in the data for your new course, type

RESTORE:GOTO390

which will stop with an O/D ERROR. If you now type

PRINTN

you will find out how many data values you have entered, and can then put this in the loop counter in line 20. Once the data is used up, the program squeaks and repeats the course.

You might also like to add a score and high score which could be calculated from the time and distance by a suitable equation such as $\text{Score} = \text{Distance} * 10 - (\text{Time} - 250) + \text{a bonus of 500 if you finish.}$

Note that if your machine will not accept the speed Poke, you will have to remove

POKE&HFFD7,0

from line 180.

The entry is at line 790 (Choose), with the right road edge stored in JStore. Choose selects the appropriate routine from five alternatives according to the position of the road. OLHS is when the road is off the left-hand side of the screen, so only a single black square and road edge character is printed.

LHS is when the road is partly off the left-

Listing 2.

```
1 REM BASIC DRIVER FOR HIRES. ROAD PROGRAM
5 CLEAR200,&H6FFF
10 PMODE3:PCLS:SCREEN1,0
11 LINE(0,0)-(256,79),PSET,B:PAINT(10,10),3,4
20 FORD=1 TO 78:READN:JO=N+64:H2=N+128
25 JS=JOYSTK(0):JP=JS-32:JO=JO-JP:H2=H2-JP
30 LINE(JO,80)-(H2,80),PSET
35 WL=(H2+JO)/2:PSET(WL,80,3)
40 EXEC&H7001
50 LINE(JO,80)-(H2,80),PRESET
60 NEXTD:RESTORE:GOTO20
70 DATA30,30,30,30,30,30,30,30,27,24,21,18,14,10,6,4,4,4,4,4,6,8
,10,12,14,16,18,19,20,21,21,21,21,21,21,23,25,27,29,30,33,33,33,
33,33,33,35,37,40,43,46,49,52,55,58,60,60,60,60,57,54,51,48,46,44,4
2,40,39,38,37,36,35,34,33,32,31,30,30,30
```

Hex dump for listing 2.

28672	C5	8E	17	E0	7F	70	0	A6	82	8C
28682	10	0	23	3D	7D	70	0	26	D	34
28692	2	84	AA	35	2	26	13	A7	88	20
28702	20	E7	4D	27	1B	34	2	43	84	AA
28712	35	2	26	12	20	ED	7C	70	0	A7
28722	88	20	1A	1	66	88	20	66	88	21
28732	20	C9	1A	1	A7	88	20	69	88	20
28742	7F	70	0	20	BC	39	A5	F	0	C

hand edge, so less than the full width will be printed. The stored value is used in line 1050 to count how many squares should be printed. If the edge is more than four spaces into the screen, we require a white centre line, so this is printed in line 1180.

Mid achieves the printing when the whole road width is within the screen, and again a white line is needed. All these routines use accumulator offset indexed addressing — for example line 1470 — and most use the stack as a temporary store — for example line 1200.

RHS and ORHS do the same tasks for road positions partly and completely off the right edge of the screen. Note that these routines have to avoid generating any wrap-around, which would spoil the display.

Now we have printed the black line in the middle of the screen, we need to copy it down the screen, widening the road as it comes towards us. We cannot just copy each line downwards with one more black square in the centre, as this would destroy any curves and perspective effects. We need to pull the screen downwards by starting at the bottom and copying each line down into the one below, widening the road as we go. We will work our way up the screen one line at a time until we reach the horizon.

This is done by Start in line 160. This seeks the edge of road characters, 136 and 132, and uses two flags to keep track. Flag 1 is set for road, clear for grass, while Flag 2 is set for right hand grass area, and clear for left hand grass area. The routine then uses LCopy and RCopy to copy the grass verges downwards with out-

ward shift by one square. The edge routines, LEdge and REdge copy the edge characters downwards and outwards, and place a black square just inboard of them. Finally, the Road routine merely does a straight downward scroll, keeping its eye open — line 320 — for the right-hand edge.

When all this scrolling has finished, the white line character is placed in the centre of the road by WhiteL — line 1820. This ensures that a 130 character and a 128 — black — character are printed alternately.

The remainder of the routines at the end of the listing store the text screen contents for instant replay in the event of a crash and a win. They are fairly self evident.

The Basic program is fairly straightforward, using a loop between lines 20-110 which I have kept as simple as possible for speed. The throttle setting alters the speed, which in turn affects a delay loop in line 80. The steering control merely alters the value passed to the machine code by line 50: all the hard work is done in assembler, in which, paradoxically, it is easier to write this sort of routine than in Basic. Probably, the options and thus possible errors are fewer in assembler, so you have to break the process down into simpler logical steps.

The remainder of the program is initialisation routines, titles and frills! The crash sequence and chequered flag are drawn on the screen and then stored by small assembler routines when the program is first run. These displays are then copied onto the screen when needed, by two more small assembler routines in lines 340 and 360.

Modifications for keyboard use.

```
30 JO=-(PEEK(344)=223)+(PEEK(343)=223)
31 IFPEEK(337)<200THENJO=JO*3
32 JO=JO*30/SP
80 TH=3*(PEEK(341)=223)-3*(PEEK(342)=223):SP=SP-TH:FORD=0 TO 4*(
100-SP):NEXT:IFSP<1 THEN SP=1:IFSP=1 THENGOTO350
375 A$=INKEY$
```


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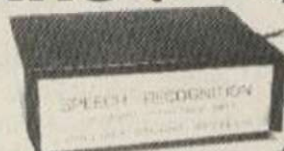
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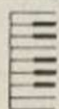
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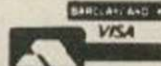
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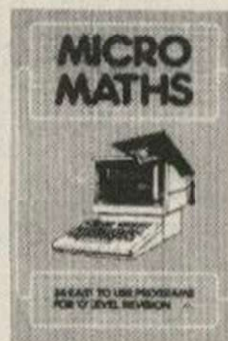
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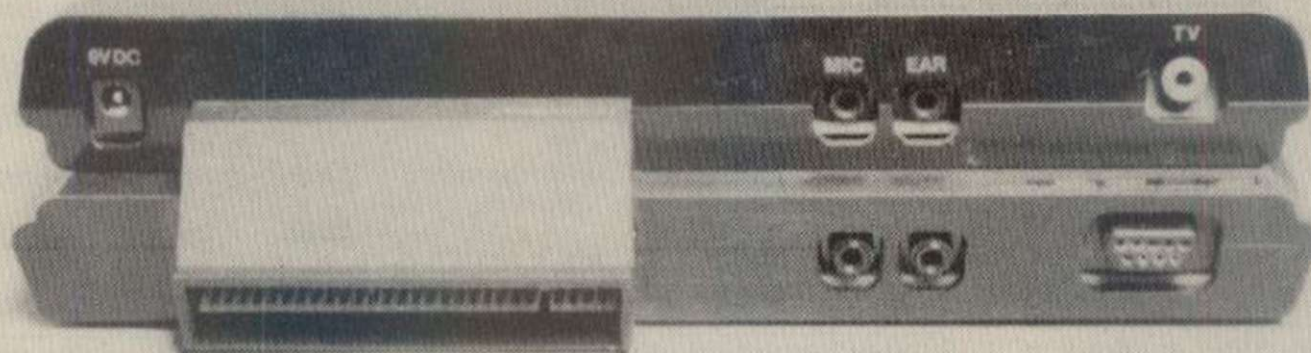
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THE MICRODRIVE FILE

THE ARRIVAL OF the ZX Microdrive greatly increases the power and versatility of the Spectrum computer. Each Microdrive cartridge can hold about 90K of programs or data and this can be accessed at a reasonably fast speed — typically three or four seconds.

This makes it feasible for a program to store large amounts of data which would not all fit into the memory of the computer in a file on the Microdrive which can be read as needed. This permits the Spectrum to tackle applications such as database management and information retrieval, as well as introducing exciting possibilities for adventure gaming.

The extra commands required for handling Microdrive files, as well as those concerned with the network and RS-232 are dealt with by a new 8K ROM inside Interface 1. The new ROM occupies the same addresses as the first half of the existing ROM, and so they cannot both be in the memory map of the computer at the same time.

The new ROM is therefore only paged in when it is needed for syntax checking or execution of the extended Basic commands, after which control returns to the old ROM. This means that you cannot examine the contents of the new ROM by using PEEK. The easiest way to make a copy of the new ROM so that it can be disassembled is to use a program like:

```
10 CLEAR 40959
20 SAVE "m";1;"newrom" CODE 0,8192
30 LOAD "m";1;"newrom" CODE 40960
```

The new ROM can then be examined, remembering to subtract 40960 (= A000 hex) from the addresses. The addresses of some of the Microdrive routines which I have found are given in table 1. Some of these are used in the improved catalog routine described here.

If you want to be able to use Microdrive routines in your own machine-code programs, you need to know about how the paging mechanism works, and how files are stored on the Microdrive. The new ROM is paged when a RST 8 instruction is encountered. In the 16K ROM, this restart is used whenever an error occurs during syntax checking or run-time. When the new ROM pages in, it checks to see whether the restart was caused by a "bonafide" error such as "Out of data", and if so control is passed back to the error routine in the old ROM.

Robert Newman continues the Microdrive series.

If the restart was due to one of the extended Basic commands — for example Erase — then the error flag is cleared and the appropriate routine in the new ROM called to process the command, after which the new ROM is paged out again. This is not the full story, however, because the authors of the new ROM have also provided a method for machine-code programs to use some of the new routines by following the RST 8 instruction with a data byte called a "hook code".

In your machine code program, RST 8 followed by one of these hook code bytes is equivalent to calling a subroutine in the new ROM. For example:

```
RST 8
DEFB 31H
```

calls a routine which sets up the new system variables used by Interface 1. Twelve of these hook codes are concerned with the Microdrive.

Most of them affect all the main Z-80 registers, and so counters etc. should be pushed to the stack before they are used, as should the alternate pair H'L' otherwise the computer might crash when it returns to Basic.

(continued on next page)

Listing 1. Catalog code dump. 523 bytes, start address = 64000.

207	49	42	101	92	237	91	99	92	167	237	82	1496
125	254	5	56	2	24	8	33	131	6	34	237	915
92	207	50	217	229	217	62	2	205	1	22	205	1509
153	30	237	67	214	92	33	255	255	34	218	92	1680
33	56	250	34	237	92	207	50	225	225	205	109	1723
6	205	232	15	221	126	25	205	247	23	1	255	1561
0	237	67	201	92	205	196	18	205	83	30	32	1366
248	221	126	67	221	182	70	230	2	32	5	205	1609
254	18	24	116	221	126	68	183	32	110	33	11	1196
252	17	12	0	6	0	221	78	13	121	183	40	943
59	229	221	229	197	6	10	35	35	126	221	170	1558
71	32	5	35	221	35	16	245	193	221	225	225	1524
40	70	48	4	25	13	24	221	229	213	197	229	1313
203	33	203	33	96	105	203	33	203	16	9	68	1205
77	225	43	9	235	25	235	237	184	193	209	225	1897
221	229	221	126	67	119	35	221	126	41	119	35	1560
6	10	221	126	71	119	221	35	35	16	247	221	1328
225	221	126	13	60	221	119	13	254	50	40	6	1348
205	18	19	194	77	250	175	205	247	23	221	229	1863
225	17	44	0	25	205	80	29	205	174	251	33	1288
11	252	17	12	0	221	70	13	120	183	202	139	1240
251	221	229	229	213	197	203	86	32	10	205	193	2069
251	62	245	205	102	29	24	110	229	35	126	221	1639
119	13	205	215	251	225	245	175	205	247	23	241	2164
32	95	205	193	251	221	126	82	254	0	40	32	1531
254	3	40	50	62	228	205	102	29	221	126	87	1407
203	119	245	230	31	198	64	205	102	29	241	40	1707
57	62	36	205	102	29	24	50	221	203	90	126	1205
32	44	62	202	205	102	29	221	78	89	221	70	1355
90	205	180	251	24	28	62	175	205	102	29	221	1572
78	85	221	70	86	205	180	251	62	44	205	102	1589
29	221	78	83	221	70	84	205	180	251	205	174	1801
251	193	209	225	221	225	25	5	194	253	250	221	2272
229	205	174	251	205	56	29	123	203	63	215	40	1793
45	215	227	45	205	174	251	221	225	205	196	16	2025
205	0	7	239	160	56	217	225	217	201	62	13	1602
205	102	29	201	221	229	229	215	43	45	215	50	1784
32	225	221	225	201	35	35	6	10	126	183	32	1331
2	62	127	205	102	29	35	16	244	62	32	205	1121
102	29	201	221	126	25	205	247	23	33	240	0	1452
34	201	92	235	196	18	221	126	41	221	190	13	1558
40	7	205	13	19	32	240	60	201	221	229	225	1497
17	67	0	25	205	169	24	205	20	19	192	17	960
15	0	25	235	70	19	201						535

(continued from previous page)

Register IX is used in most of them to point to the start address of the Microdrive channel which is used for reading from or writing to the tape and so should not be altered by your program.

The Microdrive system distinguishes between printfiles and program files. Printfiles are files which can be opened and then written to or read from using Print# and Input#. Program files are Basic programs, arrays or code which can be Saved or Loaded.

If you use the Microdrive hook codes you can only access printfiles. In order to examine program files, you have to keep the new ROM paged in so that routines in it can be called from your machine code program. This can be done with hook code 32 hex as follows:

```
LD HL, PAGE
LD (23789), HL
RST 8
DEFB 32H
PAGE POP HL
POP HL
```

After you have finished with the new ROM, CALL 700H pages it out again.

The machine code dump in listing 1 is an example of what can be done using the routines in the new ROM. It gives you a greatly improved catalog of all files on a Microdrive cartridge — see figure 1 for an example. This catalog contains details of every file on the tape, including "secret" files saved with a CHR\$ 0 as the first character of their filename.

For auto-run Basic programs, it tells you which line number it auto-runs from, and for Code files it tells you the start address which they load at and their length. Arrays which were saved using Data a() are shown in the listing by the word Data followed by the array name. Printfiles are shown by the word Print after their name in the catalog.

You should use the loader program in listing 2 to enter the machine code. After you have typed in each line of numbers, the program will give you a checksum which you should compare with that at the right hand side. If you have made a mistake you can retype that line of data. When you have finished, the code is saved to Microdrive 1. Then New the computer and type in this line:

```
10 CLEAR 63999: LOAD "m";1;"catcode"
CODE
```

Then save this with
SAVE "m";1;"cat" LINE 10

so that whenever you want to use the routine you can load it with

```
LOAD "m";1;"cat"
```

To try out the routine, put a test cartridge into drive 1. If you have made a mistake in the machine code there is a risk that the routine might go haywire and corrupt your files, so use a cartridge for your first test where this won't matter too much! Run the routine with the command Randomise 1 * USR 64000, and the catalog should appear.

If CHR\$ 0 has been used in the name of a secret file, it is printed as a copyright symbol and secret files always appear at the beginning of the listing. If any other non-printable characters have been used in the name — for example, CHR\$ 1 — they appear as a question mark. It will take longer to produce this catalog than the normal one, because a lot more information has to be read in from the tape.

If there is more than one screenfull, the

Table 1: Addresses of some of the Microdrive routines in the new ROM.

Start Address (HEX)	Action	Address	Action
0700	Page out new ROM, return 16K ROM.	11D8	Print a character to Microdrive channel.
166D	Check for valid drive number in D-STR1.	120D	Write a record to the Microdrive tape.
1FE8	Set up a temporary Microdrive channel.	1264	Examine map to see if the Microdrive is full.
10C4	Reclaim Microdrive channel.	12C4	Read next header on the tape.
112C	Inkey\$ from a Microdrive channel.	1341/1346	Calculate a checksum.
117D	Load record number CHREC of a file into channel.	17F7	Switch a Microdrive motor on or off.
		1A09	Read the next record of a printfile.
		1B29	Open a temporary Microdrive file.
		1C58	Catalog the files.

Table 2: Microdrive hook codes.

Hook code (Hex)	Function	Address	Action
21	Switch Microdrive on (A = 1 to 8), or off (A = 0).	27	Read record number CHREC of a printfile.
22/2B	Open a temporary Microdrive channel (uses system variables D-STR1, N-STR1, T-STR1). Exits with IX = start address of channel.	28	Read sector number CHREC. The contents are only useable if the sector is part of a printfile.
23	Close a Microdrive channel.	29	Read the next sector which passes the tape head. Contents only useable if sector part of printfile.
24	Erase file specified by D-STR1, N-STR1, T-STR1.	2A	Write channel to sector number CHREC.
25	Read next record of printfile.	2C	Reclaim Microdrive channel area.
26	Write a Microdrive record.	32	Call new ROM subroutine addressed by system variable HD 11.

routine will stop and give the "Scroll?" query. If you press any key except N or space, the catalog will continue.

To catalog files on a different drive, use a different number after Randomise — for example Randomise 2 * USR 6400 looks at drive 2. If you miss out the drive number, or use an invalid number, you will get an appropriate error message.

The routine is not relocatable, and it also uses 600 bytes from address 64523 as a data area.

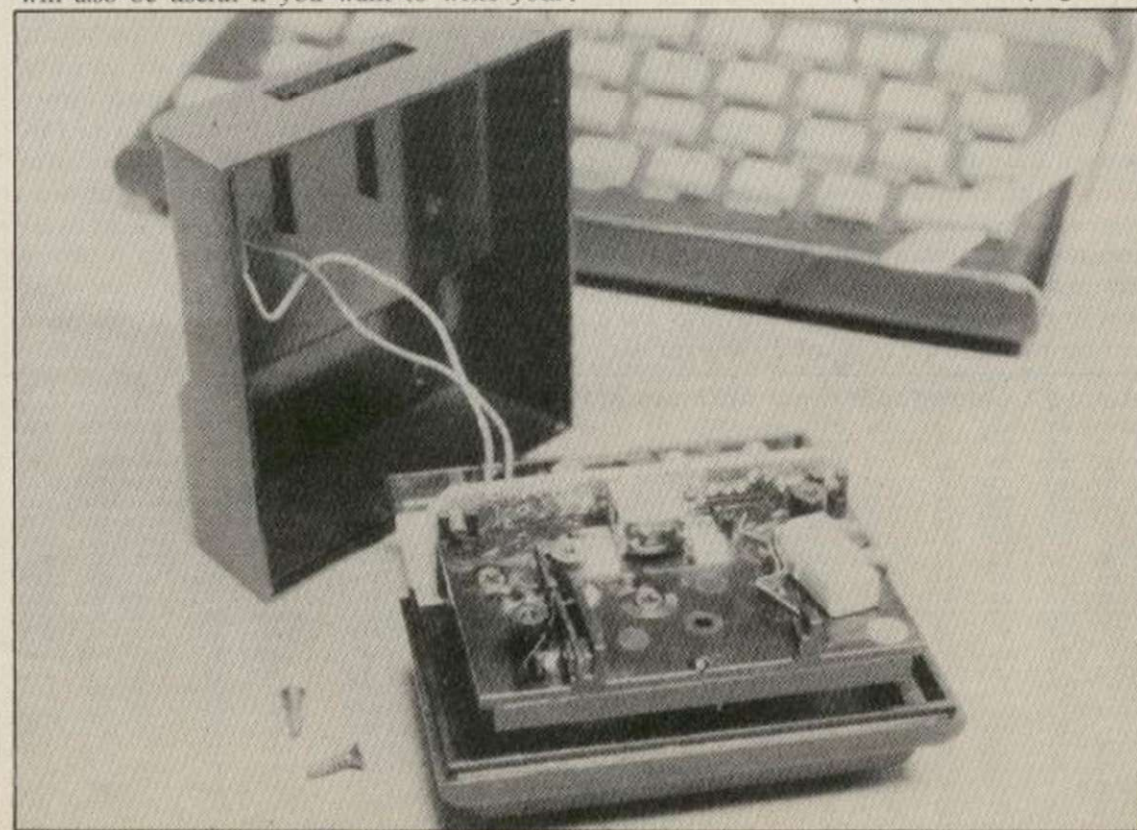
To understand how the routine works it is necessary to know something about how files are stored on the Microdrive. This information will also be useful if you want to write your

own machine code programs.

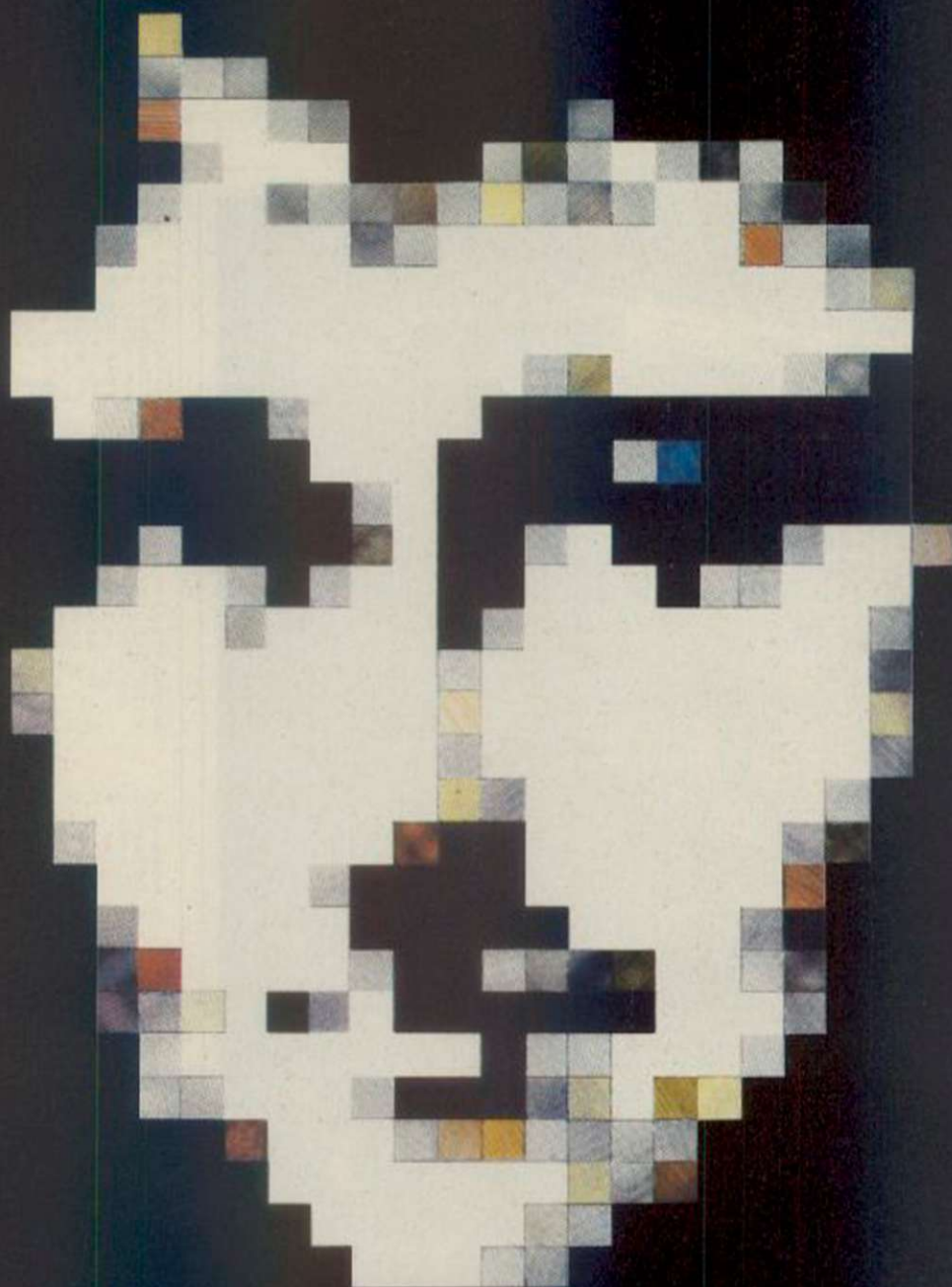
The Microdrive tape is divided up into sectors, each given a different number, starting from zero. Although the system caters for 256 sectors, in practice there are only about 180 usable ones on each tape. Each sector is divided into two parts called the header — 27 bytes long — and record — 540 bytes. There is a short gap on the tape between them.

The main information contained in the header is the name of the cartridge — given when you format the tape — and the sector number. The record is best considered as being in two parts, although there is no actual gap between them on the tape.

(continued on page 150)



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Listing 2. Loader checksum.

```

10 CLEAR 63999
20 LET n=0: LET s=0
30 LET a=64000
40 INPUT b: POKE a,b: PRINT b
50 LET n=n+1: LET s=s+b
60 LET a=a+1
70 IF n=12 THEN GO SUB 1000
80 IF a<=64522 THEN GO TO 40
90 GO SUB 1000: IF a<>"Y" AND a<>"y" THEN GO TO 40
100 SAVE "m";1;"catcode"CODE 64000,523
110 STOP
120 REM *****
1000 PRINT 'Checksum for line = ";s
1010 INPUT 'Checksum OK? (Y/N)? "a$
1020 LET t=r: LET n=0: LET s=0
1030 IF a$="Y" OR a$="y" THEN PRINT "Continue": RETURN
1040 LET a=a-t
1050 PRINT "Start again from the beginning of that line."
1060 RETURN

```



Figure 1. Examples of catalog.

```

Tape 5
@hush-hush
@secret LINE 10
catcode CODE 64000,523
chararray DATA 23
data base LINE 1
info PRINT
numarray DATA N
testprog
66

Demo
Database PRINT
Dbase prog LINE 1
P server
a LINE 10
edits CODE 89120,6167
fullcat CODE 81000,485
headread
s16 LINE 10
monprtcod CODE 85366,162
musiclabel LINE 10
net game LINE 10
rpn LINE 10
spitelabs LINE 10
title ( SCREEN$ ) CODE 16384,691
2
44

Tape 5
@my string DATA R$
catcode CODE 64000,523
data PRINT
person LINE 1
pbuf CODE 23296,256
run LINE 10
90

```

next two bytes give the length of the block. The next two are the start address.

The next two bytes are interpreted differently depending upon whether it is a Basic program or an array, and are not used for machine code. If Basic, they give the length of the program alone — i.e. excluding the variables which are also saved — and for arrays only the first byte is used and gives the name of the array — first five bits — and whether it is an array of numbers — bit 6 reset — or characters — bit 6 set. The last two bytes are only used for a Basic program and give the line number if it is auto-run — if not they equal FFFF hex.

Interface 1 and the Microdrives have opened up a new and exciting area of computing for Spectrum owners. As well as being able to access a vast amount of data which can be stored off-line on the Microdrives, with all the possibilities that this opens up for games as well as serious applications, you can also link several Spectrums together on the network, or communicate with other computers via the RS-232.

The new ROM also allows you to add your own commands, and this greatly enhances the versatility of the computer. With a knowledge of machine code the capabilities of the system can be stretched even further, and some of the techniques associated with disc-based systems could be attempted. For example it should be possible to create pseudo-random access files on the Microdrive rather than being limited to the sequential data files which are provided by Basic.

This would result in much faster access for database type programs. A machine code program should also be able to update records or write information to the end of an existing file without needing to create another file to copy the unchanged records to.

(continued from page 148)

The first part is the data descriptor section, and holds the name of the file of which this record is a part, the filetype — printfile or program — an end-of-file flag, record number, and the number of bytes of data in the next section, which is the data block. If the record is not the last one in a file, then there will be 512 bytes of data in the data block.

Depending upon the filetype, the data bytes will be either part of a printfile, Basic program, array or machine code. When you save something on the Microdrive, for example a Basic program, it is split up into chunks of 512 bytes and each one written to a different sector on the tape. The first chunk is called record number 0, the next is number 1, and so on, up to the last chunk which is written with a flag to indicate that it is the last record in the file. The system will then be able to load the program in the correct order.

Whenever information is read from or written to the tape, a Microdrive channel is set up as shown in Appendix 3 of the Microdrive and Interface 1 manual. If a file is open for reading, whenever a sector is read from the tape the header information is copied into HDFLG to HDCHK, and the record into RECFLG to

DCHK.

If the file is open for writing, these parts of the channel are copied to an unused sector of the tape when the data area is full or when the file is closed. The rest of the channel — i.e. CHBYTE to CHMAP — is used for more permanent information. During a load, for example, by comparing the filename in CHNAME with the one in a sector just read from the tape — RECNAME — the system knows whether or not that sector is part of the file that is loading. If so, CHREC and RECNUM can be compared to find out whether or not the record is the next one in the program.

With program files, the first nine bytes in the data area of the first record — number 0 — contain information telling the computer whether the file is a Basic program, an array or a block of code, how long it is, and where to load it into the memory. This is the same sort of information as that which is stored in the header of a cassette tape file when you save it, but is arranged in a different order.

In the Microdrive system, the first byte is a code byte having a value of 0 for a Basic program, 1 for a number array, 2 for a character array and 3 for machine code. The

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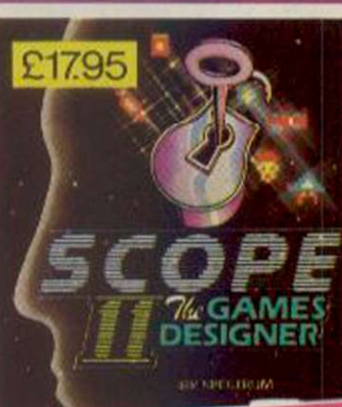
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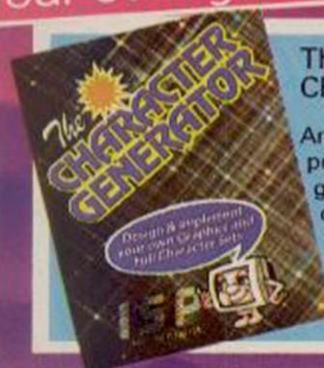


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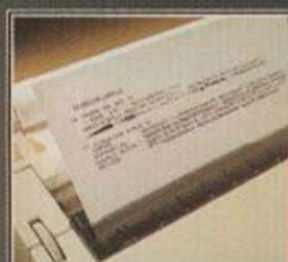
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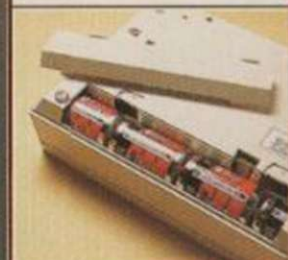
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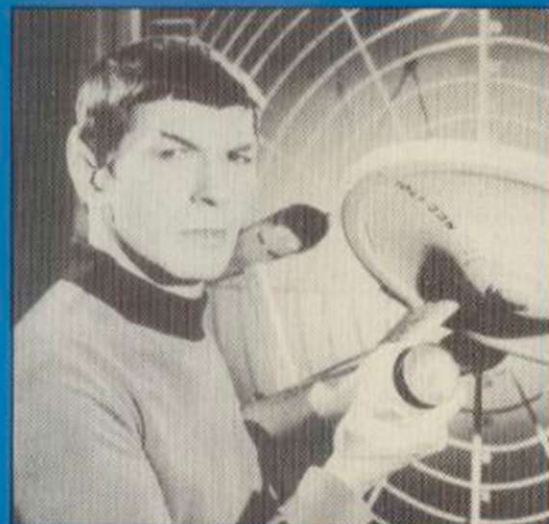
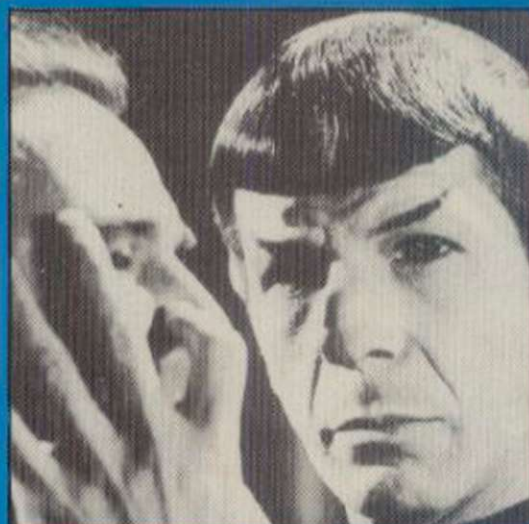
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ORIC TREK

THIS PROGRAM IS similar to the popular computer game Star Trek written for the 48K Oric-1. I see no reason why it should not work on the Atmos, but unfortunately it will not fit on the 16K Oric-1. To save the program type: **CSAVE "TREK", AUTO**

This will run the program automatically when it is loaded.

The galaxy is made up of 8 by 8 sectors of which a maximum of nine can be seen on the LRS — long range scanner — at a time. The starship is always shown in the middle of the sectors displayed. The edge of the galaxy is represented by rows of columns of Xs and if you cross this you will be destroyed.

To move sectors press 1 followed by the appropriate cursor key and the display will be redrawn to show your new position.

To change to the short-range scanner press #2 and the present display is replaced by a view of the entire sector in which you are positioned with anything else which is in that sector. A list of six possible orders are displayed on the right-hand side of the screen. These are as follows:

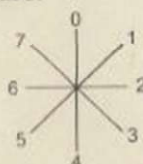
■ **Move** — pressing 1 will cause the prompt Direction? to appear. You should now press the

Dennis Salisbury explores strange new worlds with the Oric.

cursor key corresponding to the direction you wish to move and then enter the warp — followed by Return — which will move the enterprise that many places in the appropriate direction.

■ **Phasers** — when you press 2 you then have to enter the energy — followed by Return — that you wish to use. Every time you fire your phasers at a Romulan or Klingon, the enemy ships will lose energy until it is zero and they are destroyed. The amount of energy needed to destroy a Romulan or Klingon depends how close you are. It should range from about 50-200 units.

■ **Torpedos** — when you press 3 you can fire a single torpedo in one of eight possible directions. These are:



■ **Dock** — if you find a starship you can dock

with it by moving to the position immediately above or below it, and pressing 4. This will replenish shields, phasers, torpedos, fuel and crew.

■ **Land** — if you move into a position immediately next to a planet you can beam down to the planet by pressing 5. Awaiting on the planet's surface is one of six different surprises ranging from hostile attackers to rooms of treasure which can only be obtained by working out the combination of the lock on the door.

■ **LRS** — pressing 6 will return the display to long range scanner and status report.

Moving one whole sector uses up 50 units of fuel and moving one place within a sector uses up two units of fuel. Commands such as Beam Back to Ship and Strike Quickly can be carried out by pressing any key.

The starship can be destroyed in the following ways: running out of fuel; losing too many crew; being attacked while crew are on planets surface; being attacked by enemy ships when shields have insufficient energy; trying to cross the galaxy border.

The object of the game is simply to destroy all the Romulans and Klingons and at the same time collect as much treasure as possible.

```
1 FOR I=0 TO PEEK(#276):A=RND(1):NEXT
2 INK7:PAPER0:PRINTCHR$(6)
5 PRINT CHR$(17)
7 DIM KE(20),FE(20)
8 FOR I=1 TO 4:POKE#BBA3+I,32:NEXT I
10 GOSUB 500
20 GOSUB 700
30 GOSUB 1000
40 GOSUB 1100
50 GOSUB 1500
60 GOSUB 2000
70 IF F=0 THEN 95
80 GOSUB 2300
90 GOTO 50
95 GOSUB 2500
96 CLS
97 IF CO=0 THEN 101
98 CO=0
99 PLOT 30,2,"RED ALERT"
100 PLOT 29,2,1:PLOT 28,2,12:GOTO 110
101 PLOT 30,2,"CONDITION"
102 PLOT 32,3,"GREEN"
103 PLOT 31,3,2
110 GOSUB 3000
114 GOSUB 3500
115 IF ANZ=1 THEN GOSUB 3600
120 IF ANZ=2 THEN GOSUB 4000
130 IF ANZ=3 THEN GOSUB 4500
140 IF ANZ=4 THEN GOSUB 5000
```

```
150 IF ANZ=5 THEN GOSUB 5200
151 IF ANZ=6 THEN 155
153 GOSUB 6000
154 IF ANZ<>6 AND CO=1 THEN EXPLODE
155 IF ANZ=6 THEN CO=0:GOTO 50
160 IF H=1 THEN H=0:GOTO 95 ELSE 96
490 PRINT CHR$(17)
495 END
500 FOR CH=1 TO 7
510 READ AS
520 E=46080+B*AS
530 FOR DF=E TO E+7
540 READ BI
550 POKE DF,BI
555 NEXT DF
560 NEXT CH
600 DATA 38,45,45,63,45,30,63,63,30
610 DATA 96,17,31,31,31,21,4,4,14
620 DATA 95,33,33,51,63,63,63,45,12
630 DATA 64,8,42,26,54,34,54,26,42
640 DATA 35,12,22,57,47,51,30,12,0
650 DATA 42,0,0,12,30,30,12,0,0
660 DATA 45,0,0,0,127,0,0,0,0
670 RETURN
700 CLS
720 PRINT
730 PRINT CHR$(4);
740 PRINT CHR$(27);"J"
```

* STAR & TREK *

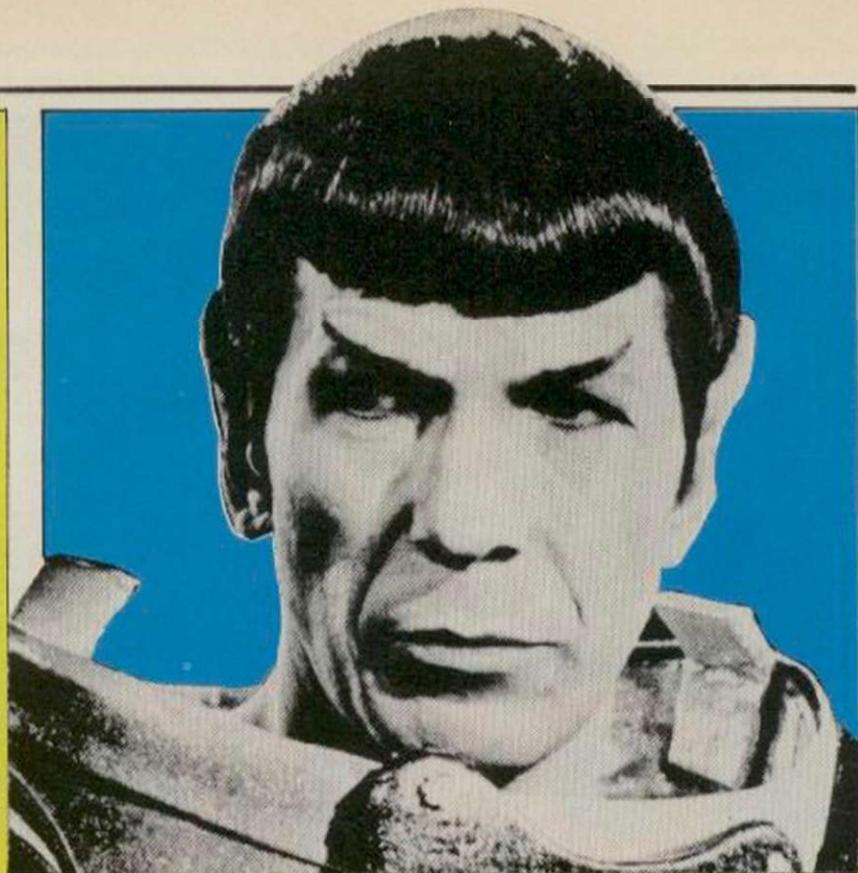
(listing continued on next page)

(listing continued from previous page)

```

745 PRINT
750 PRINT CHR$(27); "J"
760 PRINT CHR$(4)
770 PRINT
780 PRINT "You are now the Captain of the "
790 PRINT "USS Enterprise and your crew awaits"
800 PRINT "your orders. You will see your ship on"
810 PRINT "the Long Range Scanner which divides"
820 PRINT "the galaxy up into 64 sectors, but you"
830 PRINT "can only see up to 9 sectors at any"
840 PRINT "one time, so you are not always sure"
850 PRINT "exactly where you are. You must not go"
860 PRINT "off the edge of the galaxy (xxxxxxx)"
870 PRINT "but you may move sectors by pressing "
875 PRINT "1 and then the relevant cursor key."
880 PRINT "To display the Short Range"
890 PRINT "Scanner press 2. This will display"
900 PRINT "one whole sector and whatever else is"
910 PRINT "in that sector."
915 PRINT
920 PRINT "Press any key to continue."
930 B$=KEY$
940 IF B$="" THEN 930
945 CLS
947 PRINT "Your mission is to rid the galaxy"
949 PRINT "of the Klingons and Romulans and get"
950 PRINT "as much treasure as possible from the"
951 PRINT "many planets. However, you will lose if"
953 PRINT "you run out of fuel or you are attac-"
954 PRINT "ked with insufficient shield strength"
955 PRINT ". Maximum power can be regained only "
956 PRINT "by docking with a Starbase, several of"
957 PRINT "which are scattered over the galaxy."
958 PRINT "Your status report will be on the "
959 PRINT "screen at all times and the various"
960 PRINT "orders you may give will also be on"
961 PRINT "the screen."
962 PRINT "Good luck"
965 PRINT
970 PRINT "Press any key to start"
975 C$=KEY$
980 IF C$="" THEN 975
990 RETURN
1000 CLS
1010 PRINT
1020 PRINT CHR$(4); CHR$(27); "J" ** CHARACTER DEFINITI
ONS **
1025 PRINT CHR$(4)
1030 PLOT 5,8,"& - USS Enterprise"
1035 PLOT 5,10,"@ - Starbase"
1040 PLOT 5,12,"_ - Romulan ship"
1045 PLOT 5,14,"% - Klingon ship"
1050 PLOT 5,16,"# - Planet"
1060 PLOT 5,20,"Press any key to continue"
1065 D$=KEY$
1070 IF D$="" THEN 1065
1080 RETURN
1100 UX=INT(RND(1)*8+1)
1110 UY=INT(RND(1)*8+1)
1120 SX=INT(RND(1)*28+1)
1125 SY=INT(RND(1)*20+1)
1140 FOR K=1 TO 20
1145 KX=INT(RND(1)*8+1)
1150 KY=INT(RND(1)*8+1)
1155 IF KP(KX,KY)=2 THEN 1145
1160 KP(KX,KY)=KP(KX,KY)+1
1170 RX=INT(RND(1)*8+1)
1180 RY=INT(RND(1)*8+1)
1185 IF RP(RX,RY)=2 THEN 1170
1190 RP(RX,RY)=RP(RX,RY)+1
1195 NEXT K
1200 FOR S=1 TO 5
1210 BX=INT(RND(1)*8+1)
1220 BY=INT(RND(1)*8+1)
1230 BP(BX,BY)=BP(BX,BY)+1
1240 NEXT S
1250 FOR P=1 TO 40
1260 PX=INT(RND(1)*8+1)
1270 PY=INT(RND(1)*8+1)
1275 IF PL(PX,PY)=1 THEN 1260
1280 PL(PX,PY)=PL(PX,PY)+1
1285 DP(PX,PY)=INT(RND(1)*6+1)
1290 NEXT P
1295 DD=DD+1000
1300 SH=1000
1305 PH=500
1310 TP=20
1315 TR=0
1317 CO=0
1320 FU=1000
1325 CR=283
1330 NK=20:NR=20
1340 FOR I=1 TO 20
1345 KE(I)=10+KE(I)
1350 RE(I)=10+RE(I)
1360 NEXT I
1400 RETURN
1500 CLS
1530 IF UX<2 THEN P=8 ELSE P=4

```



```

1540 IF UX>7 THEN Q=12 ELSE Q=16
1550 IF UY<2 THEN R=8 ELSE R=4
1560 IF UY>7 THEN S=12 ELSE S=16
1570 FOR I=P TO Q STEP 4
1580 FOR J=R TO S
1590 PLOT I,J,"+"
1600 NEXT J
1605 NEXT I
1610 FOR I=R TO S STEP 4
1615 FOR J=P TO Q
1620 PLOT J,I,"+"
1630 NEXT J
1635 NEXT I
1640 IF UX>2 THEN 1700
1660 FOR B=R TO S
1670 PLOT P,B,"x"
1680 NEXT B
1690 GOTO 1750
1700 IF UX<7 THEN 1750
1710 FOR B=R TO S
1720 PLOT Q,B,"x"
1730 NEXT B
1750 IF UY>2 THEN 1800
1760 FOR B=P TO Q
1770 PLOT B,R,"x"
1780 NEXT B
1790 GOTO 1850
1800 IF UY<7 THEN 1850
1810 FOR B=P TO Q
1820 PLOT B,S,"x"
1830 NEXT B
1850 PLOT 10,10,"&"
1860 RETURN
2000 PLOT 7,1,"Long Range"
2006 PLOT 9,2,"Scanner"
2010 PLOT 24,4,"Status Report"
2015 PLOT 24,5,"-----"
2020 PLOT 23,7,"Shields --"
2025 PLOT 33,7,STR$(SH)
2030 PLOT 23,9,"Phasers --"
2035 PLOT 33,9,STR$(PH)
2040 PLOT 23,11,"Torpedos --"
2045 PLOT 33,11,STR$(TP)
2050 PLOT 23,13,"Treasure --"
2055 PLOT 33,13,STR$(TR)
2060 PLOT 23,15,"Fuel --"
2065 PLOT 33,15,STR$(FU)
2070 PLOT 23,17,"Crew --"
2080 PLOT 33,17,STR$(CR)
2090 PLOT 23,19,"Klingons --"
2095 PLOT 33,19,STR$(NK)
2097 PLOT 23,21,"Romulans --"
2098 PLOT 33,21,STR$(NR)
2100 PLOT 4,20,"You can--"
2110 PLOT 3,21,"1. MOVE SECTORS"
2120 PLOT 3,22,"2. CHANGE SCANNER"
2130 AN$=KEY$
2140 IF AN$<>"1" AND AN$<>"2" THEN 2130
2145 D=VAL(AN$):GOSUB 8000
2150 IF AN$="1" THEN F=1 ELSE F=0
2180 RETURN
2300 PLOT 3,25,"Direction?"
2320 D$=KEY$
2330 IF D$="" THEN 2320
2340 IF ASC(D$)<8 OR ASC(D$)>11 THEN 2320
2350 M=ASC(D$)
2355 D=M-5:GOSUB 8000

```

(listing continued on page 156)

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(listing continued from page 154)

```

2360 IF M=8 THEN UX=UX-1
2370 IF M=9 THEN UX=UX+1
2380 IF M=10 THEN UY=UY+1
2390 IF M=11 THEN UY=UY-1
2400 FU=FU-50
2410 GOSUB 10000
2420 RETURN
2500 IF KP(UX,UY)=0 THEN 2560
2520 CO=1
2525 FOR K=1 TO KP(UX,UY)
2530 RK(K)=INT(RND(1)*20+1)
2540 SK(K)=INT(RND(1)*20+1)
2550 NEXT K
2560 IF RP(UX,UY)=0 THEN 2620
2565 CO=1
2570 FOR R=1 TO RP(UX,UY)
2580 RR(R)=INT(RND(1)*20+1)
2590 SR(R)=INT(RND(1)*20+1)
2610 NEXT R
2620 IF BP(UX,UY)=0 THEN 2700
2630 FOR S=1 TO BP(UX,UY)
2640 RS(S)=INT(RND(1)*20+1)
2650 ST(S)=INT(RND(1)*20+1)
2670 NEXT S
2700 IF PL(UX,UY)=0 THEN 2750
2710 FOR P=1 TO PL(UX,UY)
2720 OP(P)=INT(RND(1)*20+1)
2730 SP(P)=INT(RND(1)*20+1)
2745 NEXT P
2750 RETURN
3000 PLOT 32,5,"Orders="
3020 PLOT 32,6,"-----"
3025 PLOT 29,8,"1. MOVE"
3030 PLOT 29,10,"2. PHASERS"
3035 PLOT 29,12,"3. TORPEDS"
3040 PLOT 29,14,"4. DOCK"
3050 PLOT 29,16,"5. LAND"
3060 PLOT 29,18,"A. LRB"
3100 PLOT SX,SY,"&"
3120 IF KP(UX,UY)=0 THEN 3160
3122 CO=1
3125 FOR K=1 TO KP(UX,UY)
3130 PLOT RK(K),SK(K),"&"
3135 NEXT K
3160 IF RP(UX,UY)=0 THEN 3220
3162 CO=1
3170 FOR R=1 TO RP(UX,UY)
3200 PLOT RR(R),SR(R),"&"
3210 NEXT R
3220 IF BP(UX,UY)=0 THEN 3300
3230 FOR S=1 TO BP(UX,UY)
3260 PLOT RS(S),ST(S),"&"
3270 NEXT S
3300 IF PL(UX,UY)=0 THEN 3350
3310 FOR P=1 TO PL(UX,UY)
3340 PLOT SP(P),OP(P),"&"
3345 NEXT P
3350 GET ANK
3355 IF ASC(ANK)<48 OR ASC(ANK)>54 THEN 3350
3360 ANK=VAL(ANK)
3370 D=ANK GOSUB 8000
3400 RETURN
3500 IF KP(UX,UY)=0 THEN 3550
3520 FOR I=1 TO KP(UX,UY)
3530 DK(I)=(RK(I)-SX)^2+(SK(I)-SY)^2*.5
3540 NEXT I
3550 IF RP(UX,UY)=0 THEN 3590
3560 FOR I=1 TO RP(UX,UY)
3570 DR(I)=(RR(I)-SX)^2+(SR(I)-SY)^2*.5
3580 NEXT I

```

```

3590 RETURN
3600 PLOT 29,20,"Direction?"
3620 GET D#
3630 IF ASC(D#)<48 OR ASC(D#)>49 THEN 3620
3640 D=ASC(D#)
3645 D=M-5:GOSUB 8000
3646 INPUT "Narp(1 to 19):"N#
3647 IF N#<1 OR N#>19 THEN 3646
3648 N#=(N#-1)*19
3650 IF N#>0 THEN SX=SX-N#
3660 IF N#>0 THEN SY=SY-N#
3670 IF N#>0 THEN SY=SY+N#
3680 IF N#>0 THEN SX=SX+N#
3690 FU=FU-2*N#
3695 R=0
3700 IF SX<0 AND SX<29 AND SY<0 AND SY<21 THEN 3700
3710 IF SX<1 THEN SX=SX+20:UX=UX-1
3720 IF SX<28 THEN SX=SX-20:UX=UX+1
3730 IF SY<1 THEN SY=SY+20:UY=UY-1
3740 IF SY<20 THEN SY=SY-20:UY=UY+1
3742 IF KP(UX,UY)=0 AND RP(UX,UY)=0 THEN CO=0 ELSE CO=1
3745 R=1
3750 GOSUB 10000
3800 RETURN
4000 PLOT 29,20,"Energy?"
4020 INPUT EN
4030 IF PH=EN THEN 4100
4040 IF SH=PH=EN THEN 4070
4050 A#="Run out of energy"
4060 GOTO 11000
4070 SH=SH+PH=EN
4080 PH=0
4090 GOTO 4150
4100 PH=PH=EN
4110 J#P
4150 IF KP(UX,UY)=0 THEN 4250
4160 FOR I=1 TO KP(UX,UY)
4165 DK(I)=(RK(I)-SX)^2+(SK(I)-SY)^2*.5
4170 DK(I)=EN/DK(I)
4180 KE(I)=KE(I)-DK(I)
4185 IF KE(I)>0 THEN 4220
4190 PLOT RK(I),SK(I),"EXPLD"
4195 KP(UX,UY)=KP(UX,UY)-1:NR=NR-1
4197 IF NR=0 AND NR=0 THEN 12000
4200 IF KE(I)<0 THEN KE(I)=KE(I)+RK(I)-RK(2):SK(I)=SK(I)+SK(2)
4220 NEXT I
4250 IF RP(UX,UY)=0 THEN 4350
4260 FOR I=1 TO RP(UX,UY)
4265 DR(I)=(RR(I)-SX)^2+(SR(I)-SY)^2*.5
4270 DR(I)=EN/DR(I)
4280 RE(I)=RE(I)-DR(I)
4285 IF RE(I)>0 THEN 4320
4290 PLOT RR(I),SR(I),"EXPLD"
4295 RP(UX,UY)=RP(UX,UY)-1:NR=NR-1
4297 IF NR=0 AND NR=0 THEN 12000
4300 IF RE(I)<0 THEN RE(I)=RE(I)+RR(I)-RR(2):SR(I)=SR(I)+SR(2)
4320 NEXT I
4350 IF KP(UX,UY)=0 AND RP(UX,UY)=0 THEN CO=0
4400 RETURN
4500 IF TP=0 THEN 4510
4505 PRINT "Out of torpedoes"
4507 GOTO 4800
4510 PLOT 29,20,"Direction?"
4520 PLOT 32,21,"(0-7)"
4530 GET D#
4535 D=VAL(D#):GOSUB 8000
4540 IF D>7 THEN 4530
4550 IF D=0 OR D=4 THEN TX=0:GOTO 4560
4560 IF D>0 AND D<4 THEN TX=1:GOTO 4560

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```

4570 TX=1
4580 IF D=2 OR D=6 THEN TY=0:GOTO 4610
4590 IF D=2 AND D=6 THEN TY=1:GOTO 4610
4600 TY=1
4610 Z#P
4615 REPEAT
4620 Z=Z+1
4622 F=2
4625 J=SCRN(SX+Z*TX,SY+Z*TY)
4630 PLOT SX+Z*TX,SY+Z*TY,"&"
4660 IF J=95 OR J=96 THEN I=0:EXPLODE
4670 IF SX+Z*TX<1 OR SX+Z*TX>28 THEN Z=0
4680 IF SY+Z*TY<1 OR SY+Z*TY>20 THEN Z=0
4690 PLOT SX+Z*TX,SY+Z*TY,"&"
4700 UNTIL Z=0
4710 IF J<95 AND J<96 THEN 4790
4715 IF J=96 THEN 4795
4720 RP(UX,UY)=RP(UX,UY)-1:NR=NR-1
4730 IF SX+K*TX=RR(1) AND SY+K*TY=SR(1) THEN RR(1)=RR(2):SR(1)=SR(2)
4750 GOTO 4790
4755 KP(UX,UY)=KP(UX,UY)-1:NR=NR-1
4760 IF SX+K*TX=RK(1) AND SY+K*TY=SK(1) THEN RK(1)=RK(2):SK(1)=SK(2)
4790 TP=TP-1
4795 IF KP(UX,UY)=0 AND RP(UX,UY)=0 THEN CO=0
4797 IF NR=0 AND NR=0 THEN 12000
4800 RETURN
5000 IF SCRN(SX,SY+1)=64 OR SCRN(SX,SY-1)=64 THEN 5050
5020 PLOT 3,23,"Docking Negative!"
5030 WAIT 100:GOTO 5150
5050 PLOT 3,23,"Docking Affirmative"
5060 MUSIC 2,3,4,10
5070 PLAY 3,0,7,2000
5080 WAIT 15
5085 MUSIC 2,5,10,10
5090 PLAY 3,0,7,2000
5100 WAIT 10:PLAY 0,0,0,0
5110 FU=1000:SH=1000
5120 PH=500
5130 CR=203
5140 TP=20
5145 WAIT 100
5150 RETURN
5200 IF SCRN(SX+1,SY)=35 OR SCRN(SX-1,SY)=35 THEN PN=1 ELSE PN=0
5220 IF SCRN(SX,SY+1)=35 OR SCRN(SX,SY-1)=35 THEN PN=1
5230 IF PN=1 THEN 5260
5240 PLOT 3,25,"Beaming not possible"
5245 WAIT 200
5250 GOTO 5400
5260 MUSIC 1,5,8,0
5270 PLAY 3,0,7,2000
5280 WAIT 300
5290 PLAY 0,0,0,0
5300 PLOT 3,25,"You have beamed down safely!"
5305 WAIT 300
5307 PLOT 3,25,""
5310 GOSUB 9000
5400 RETURN
6000 IF KP(UX,UY)=0 THEN 6100
6015 FOR I=1 TO KP(UX,UY)
6017 IF DK(I)=0 THEN DK(I)=1
6020 SH=SH-INT(DK(DK(I)))
6030 IF SH>0 THEN 6100
6040 GOTO 10000
6100 IF RP(UX,UY)=0 THEN 6200
6110 FOR I=1 TO RP(UX,UY)
6115 IF DR(I)=0 THEN DR(I)=1

```

(listing continued on page 158)

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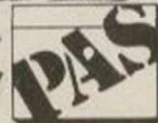
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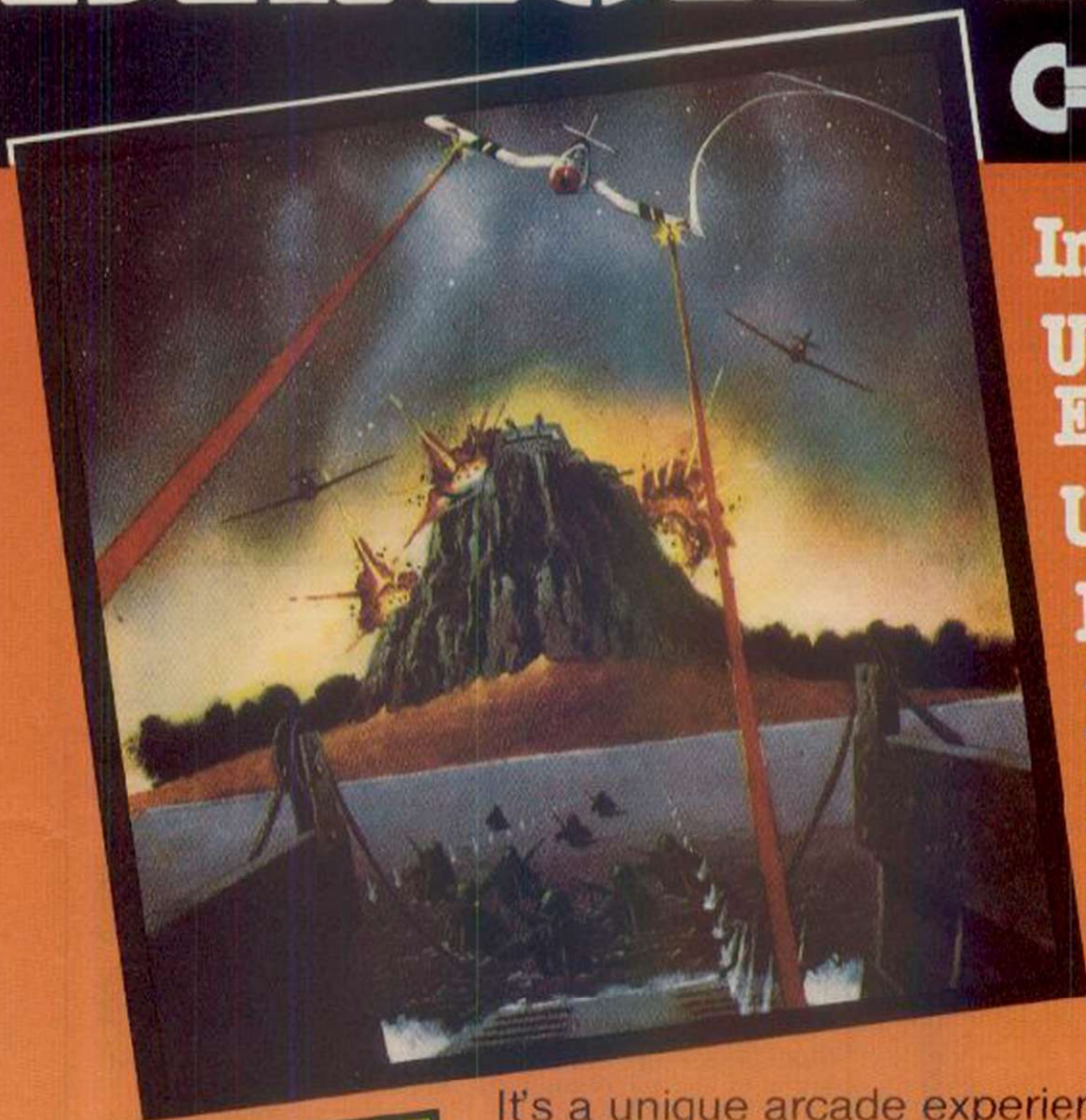
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(listing continued from page 156)

```

6120 SH=SH-INT(500/DR(1))
6140 IF SH=0 THEN 6150
6145 GOTO 10000
6150 CK=INT(RND(1)*16)
6160 CR=CR-CK
6200 RETURN
8000 MUSIC 2,0,0+1,10
8010 PLAY 3,0,7,2000
8020 WAIT 10
8030 PLAY 0,0,0,0
8050 RETURN
9000 IF OP(UX,UY)=0 THEN 9050
9030 IF OP(UX,UY)=2 THEN 9200
9040 IF OP(UX,UY)=3 THEN 9400
9050 IF OP(UX,UY)=4 THEN 9400
9055 IF OP(UX,UY)=5 THEN 9500
9060 IF OP(UX,UY)=6 THEN 9500
9065 PLOT 3,25,"Footsteps approach..."WAIT 200
9070 PLOT 3,25,"Quick! You are being attacked..."WAIT
200
9075 PLOT 3,25,"Be up to the Enterprise before you
are all killed!"
9077 CK=0
9080 REPEAT
9085 CK=CK+1
9090 BE=KEYS
9095 IF CK=65 THEN BE="S"
9100 UNTIL BE<"S"
9105 IF CK=65 AND CK=4 THEN 9110
9106 AS="You have failed your mission, having been kil
led by the attackers"
9107 GOTO 11000
9110 CR=CR-CK
9115 PLOT 3,25,"That was close..."
9120 WAIT 300
9125 PLOT 3,25,"...but you lost"
9130 PLOT 19,25,STR$(CK)
9135 PLOT 23,25,"crew..."WAIT 200
9180 GOTO 9900
9200 PLOT 3,25,"The planet contains crystals..."WAIT
300
9205 PLOT 3,25,"capable of regenerating your phasers"
WAIT 300
9210 PLOT 3,25,"Be up to the ship and install
them"
9220 GET BE$
9230 PH=500
9240 PLOT 3,25,"Crystals installed"
WAIT 200
9250 GOTO 9900
9300 PLOT 3,25,"Scanners show planet is rich in fuel"
WAIT 300
9310 PLOT 3,25,"Be up to ship with fuel"
9320 GET BE$
9330 PLOT 3,25,"Fuel now full."
9400 FU=1000
9410 PLOT 3,25,"Footsteps approach..."WAIT 200
9410 PLOT 3,25,"Friendly inhabitants..."WAIT 2
50
9420 PLOT 3,25,"...but nothing to offer except food."
WAIT 300
9430 PLOT 3,25,"Be up to ship."
9440 GET BE$
9450 GOTO 9900
9500 PLOT 3,25,"Footsteps approach..."WAIT 200
9510 PLOT 3,25,"Quick! It's the dreaded beast of Trog..."
WAIT 200
9520 CK=0
9530 PLOT 3,25,"Strike quickly..."

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9532 TI=0
9533 AS="You have been killed by the beast of Trog"
9535 REPEAT
9540 TI=TI+1
9550 BE=KEYS
9555 IF TI=100 THEN BE="S"
9560 UNTIL BE<"S"
9562 IF TI=100 THEN 11000
9565 IF TI=15 AND TI=5 THEN 9580
9570 PLOT 3,25,"Missed..."WAIT 200
9575 CK=CK+1 IF CK>5 THEN 11000 ELSE 9530
9580 CR=CR-CK
9590 PLOT 3,25,"You have killed the beast and..."WAIT
300
9591 PLOT 3,25,"collected 10 units of treasure..."WAIT
300
9592 PLOT 3,25,"Be up to ship with the treasure."
9593 GET BE$
9594 TR=TR+10
9595 GOTO 9900
9600 REM
9605 COMB=" "
9610 OP(UX,UY)=0
9620 CLS
9625 PRINT
9630 PRINT "You have found a room which contains"
9635 PRINT "an unknown amount of treasure. But the"
9640 PRINT "door is firmly sealed and can only be"
9645 PRINT "opened by typing in the correct four"
9650 PRINT "number combination of the lock."
9655 PRINT "No two numbers in the combination"
9660 PRINT "are the same, but time is limited and"
9665 PRINT "you only have 6 attempts to guess the"
9670 PRINT "combination."
9675 BASE=INT(RND(1)*4+4)
9680 PRINT "Since the inhabitants use base "BASE
9685 PRINT "only the numbers 0 to "BASE-1" will be"
9690 PRINT "included in the combination."
9695 PRINT "(Remember-when you type in a number you
cannot change it)"
9700 PRINT "Having typed in the combination two"
9702 PRINT "numbers will appear. The first number"
9703 PRINT "represents how many of your numbers"
9704 PRINT "are in the correct position, and the"
9705 PRINT "second represents how many of your"
9706 PRINT "numbers are correct but in the wrong"
9707 PRINT "position."
9709 PRINT "Press any key to continue"
9710 GET BE$
9712 CLS
9714 CLS
9720 FOR I=1 TO 4
9725 RE=INT(RND(1)*BASE)
9730 IF I=1 THEN 9750
9735 FOR J=1 TO 1-1
9740 IF RE(J)=RN(1) THEN 9725
9745 NEXT J
9750 COMB=COMB+STR$(RE(I))
9752 NEXT I
9767 FOR GUESS=1 TO 6
9768 COMB=" "
9770 PRINT "Combination >"
9772 FOR I=1 TO 4
9774 GET BE$
9776 IF ASC(GB)<ASC("0") OR ASC(GB)>ASC("9")+BASE-1 THE
N 9774
9777 B=VAL(GB):BOSUD B000
9778 PRINT B$
9780 COMB=COMB+B$
9782 NEXT I
9784 B=0:M=0
9786 FOR CHECK=1 TO 4
9788 IF VAL(MID$(COMB,CH,1))-RN(1) THEN B=B+1
9790 FOR WHITE=1 TO 4

```

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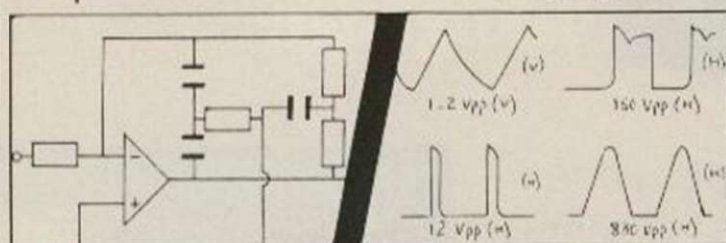
9792 IF VAL(MID$(COMB,CH,1))-RN(1) THEN B=B+1
9794 NEXT CH
9796 NEXT CH
9798 IF B=4 THEN 9820
9800 W=M-B
9802 PRINT SPC(6);B;SPC(8);M
9804 PRINT
9806 NEXT BU
9808 WAIT 200:CLS:PRINT
9810 PRINT "Hard luck-but it's time to leave."
9812 PRINT "The treasure is gone for good now so"
9814 PRINT "don't come back!"
9816 PRINT "Be up to ship."
9818 GOTO 9860
9820 CLS:PRINT
9822 PLOT 10,1,"WELL DONE!"
9824 PLOT 10,2,"WELL DONE!"
9826 PLOT 9,2,14
9828 PLOT 9,1,14
9830 PRINT:PRINT
9832 TU=INT(RND(1)*21+10)
9833 PRINT:PRINT
9834 PRINT "You have collected "TU" units of
treasure."
9836 PRINT "Be up to ship with treasure."
9838 TR=TR+TU
9840 GOTO 9860
9850 PLOT 3,25,"No treasure left..."
9855 PLOT 3,25,"Be up to ship"
9860 GET BE$
9900 RETURN
10000 IF FU=0 THEN AS="You have run out of fuel. Game
over" GOTO 11000
10010 IF SH=0 THEN AS="You have been blown to bits.
Game over" GOTO 11000
10020 IF CR=150 THEN AS="You have lost too many crew.
Game over" GOTO 11000
10030 RETURN
11000 CLS:PLOT 10,10,AS
11010 PLOT 10,15,"Another game(Y/N)?"
11020 GET AN$
11030 IF AN$="N" THEN 495
11040 IF AN$="Y" THEN 11060
11050 GOTO 11020
11060 PLOT 5,17,"Do you need instructions(Y/N)?"
11070 GET AN$
11080 IF AN$="Y" THEN RUN 7
11090 IF AN$="N" THEN CLEAR:DIM KE(20):RE(20):GOTO 40
11100 GOTO 11070
12000 CLS:PRINT
12010 PRINT CHR$(4);CHR$(27);J WELL DONE!
12020 PRINT CHR$(4)
12030 PRINT:PRINT
12040 PRINT "You have defeated the Klingons and"
12045 PRINT "Romulans and collected "TU" units of"
12047 PRINT "treasure."
12050 PRINT "Now try again-but this time you will"
12060 PRINT "not find it so easy. They will not be"
12070 PRINT "so easy to destroy and will damage"
12080 PRINT "your ship more."
12085 PRINT
12090 PRINT "Good luck!"
12100 PRINT
12110 PRINT "Press any key to start again."
12120 GET BE$
12125 FOR X=1 TO 8
12130 FOR Y=1 TO 8
12140 KP(X,Y)=0:RP(X,Y)=0
12150 BP(X,Y)=0:PL(X,Y)=0
12160 OP(X,Y)=0
12170 NEXT Y
12180 NEXT X
12190 GOTO 40

```

Spectre



ENFIELD HOUSE
SWARDESTON
NORWICH
NORFOLK

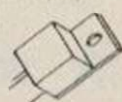


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QL Competition RESULTS

APRIL'S BEFORE AND AFTER COMPETITION proves that *Your Computer* readers will do anything to get their hands on a QL — mind you, so would most of the people who sent off their £400 cheques to Sinclair four months ago and are still waiting.

To win a new Sinclair you had to send in a sketch or photograph of your existing computer system — the Before — which would convince us that you needed a tidy QL — the After — to replace it. This seemed to spark all your creative instincts. We were deluged with pictures of very strange looking systems indeed — which could explain why some of you have such difficulty typing in listings.

One of the weirdest entries was neither a sketch nor a photograph but a lump of crushed metal with wires sticking out the end which PJ Thys of Leiden in Holland claims actually is his old computer. Tests by

the *Your Computer* forensic laboratory reveal that PJ Thys's lump of metal is a car hub cap so it's no wonder he wants a QL.

Other odd entries included an anonymous nude picture — of a three year old boy, and from Zunic Davor of Zagreb Yugoslavia a photograph of a snowman with an uncanny resemblance to Sir Clive. Maybe he's been snowed in since the Winter Olympics and that's why we've had to wait for our QLs.

While some sent in accurate detailed drawings of their systems others sent in caricatures — at least that's what we hope they are otherwise there are a lot more of you running Cray 1s off ZX keyboards than we had ever imagined. If Andrew Heggie's sepia drawing is to be believed his home in Glenrothes — Scotland's silicon glen — is dominated by a 1 RAM system, the type that comes complete with horns being pursued by a sheepdog.

which includes blackboard, 1920's gramophone and abacus amongst its peripherals.

Malcolm Banthorpe of Northolt, Middlesex, needs a QL because the Galactic Union of Invasion Operatives and Allied Nasties has mounted an official picket of his old American Atari. They are demanding a 16 bit QL — 8 is not enough. Well Malcolm if you will go for an old American trouble shooter you cannot expect us to interfere in your bit strike.

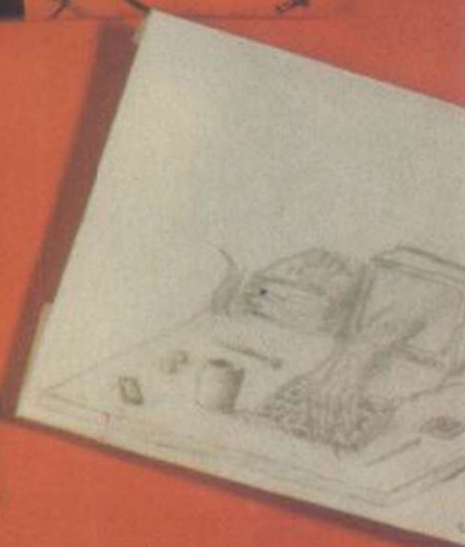
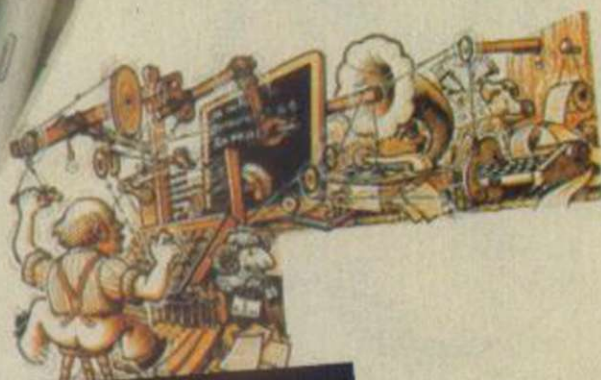
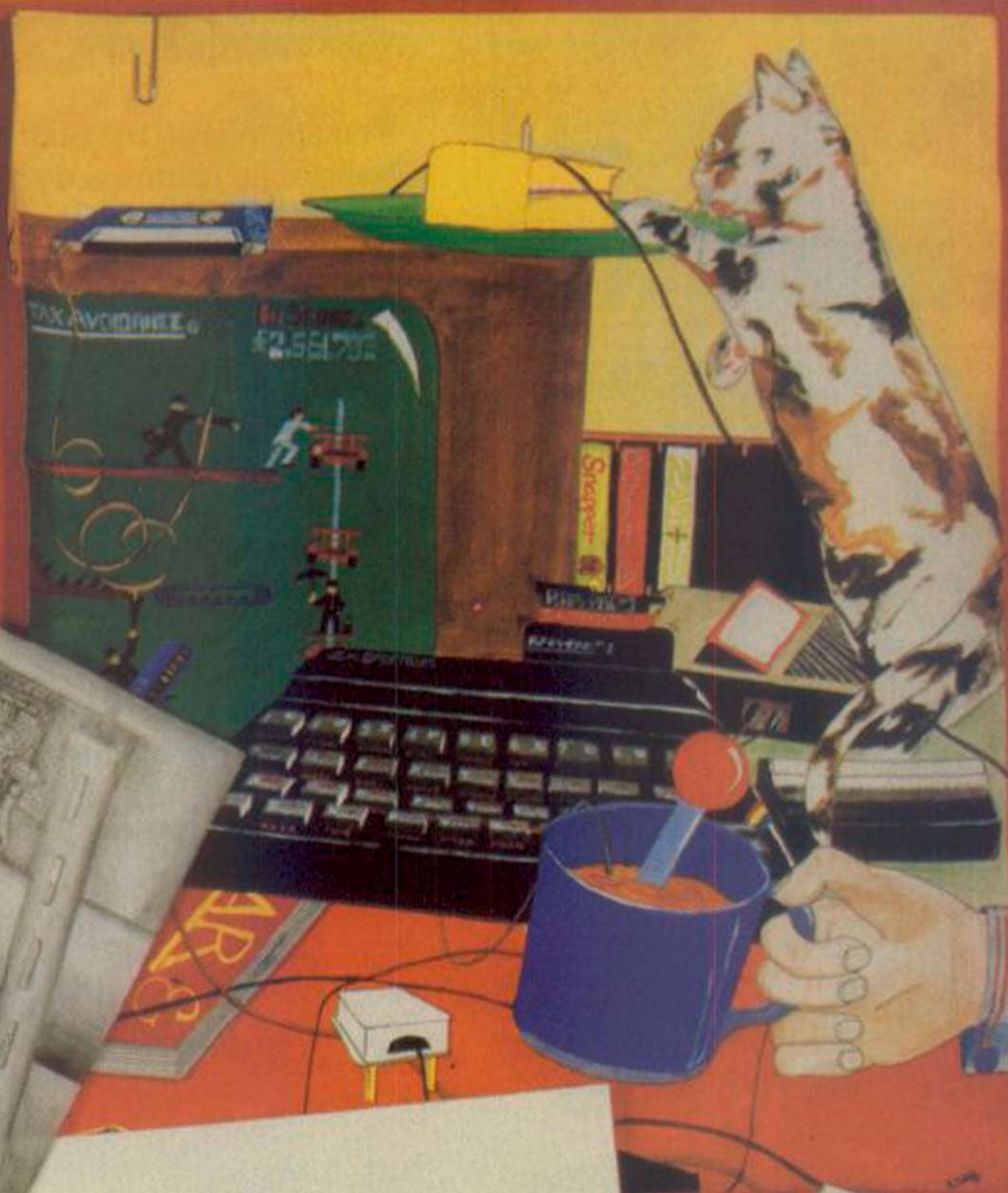
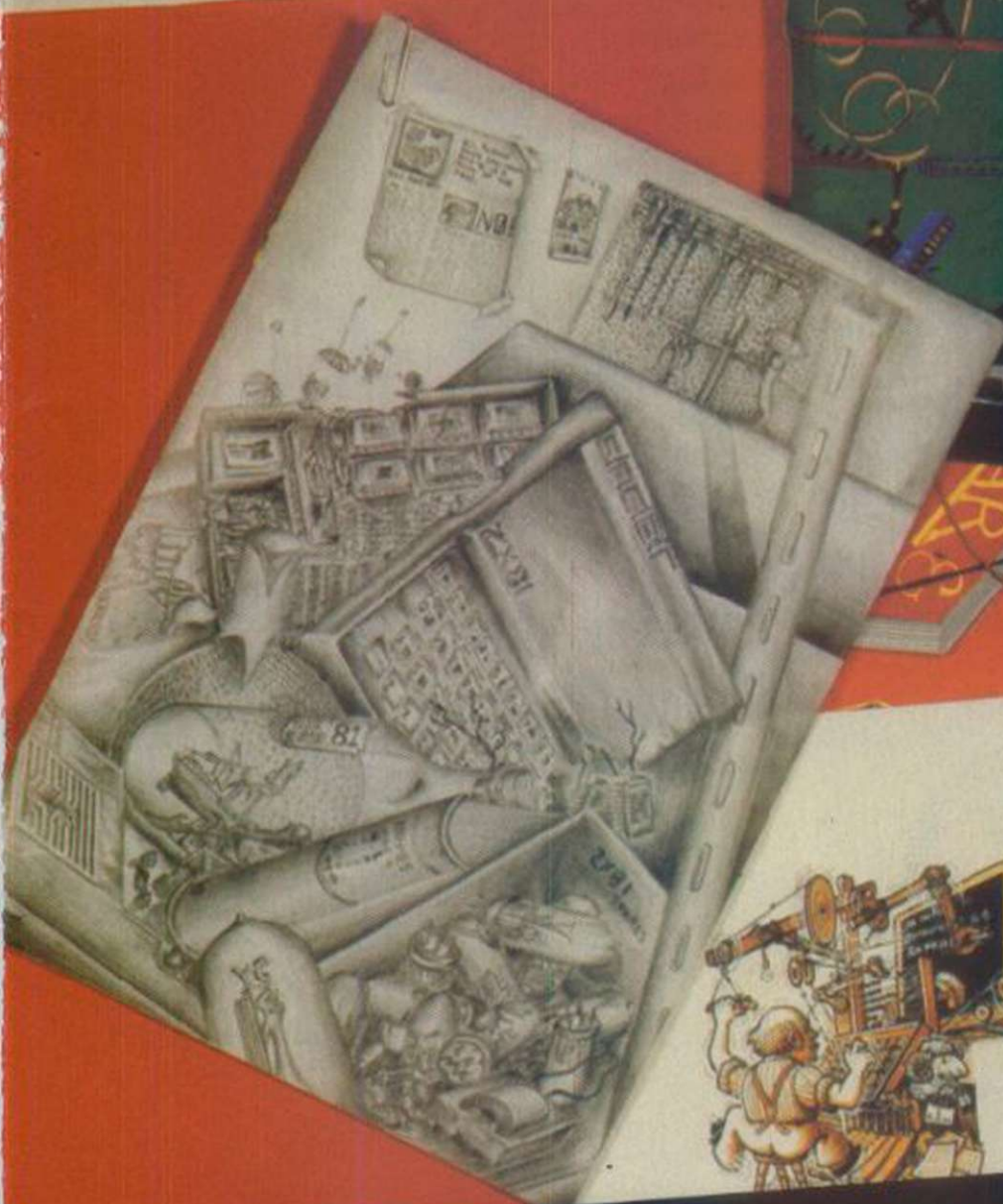
The most popular "Before" was an abacus — we had several hundred of them — and running that close was spaghetti. Fortunately, nobody sent in any half-eaten pasta but Ernest Babbington of Highgate, London, sent in a section of a Heinz wrapper.

Dogs crashing through your systems and cats sitting on over-warm power packs were another obsession of the competitors. Richard Trollis of Oxford was moved to paint a full colour masterpiece of his cat knocking a joystick into the inevitable cup of coffee.

Collages were also popular. Adrian Oates of Guildford included a picture of Sir Clive being swallowed by a Pacman on his — the ultimate video nasty.

Quiche Lorraine "because preparation is lengthy but its worth the wait" was a team entry from Sime, Andy and Deb from Corsham in Wiltshire. It wasn't the best slogan but that's only meant to be a tie-breaker. Instead of a sketch or a photo of their current system they sent in a colourful scale model — not strictly within the rules but in a competition brimming with original entries we felt obliged to show some imagination in our judging so the Corsham trio win the QL for their efforts.





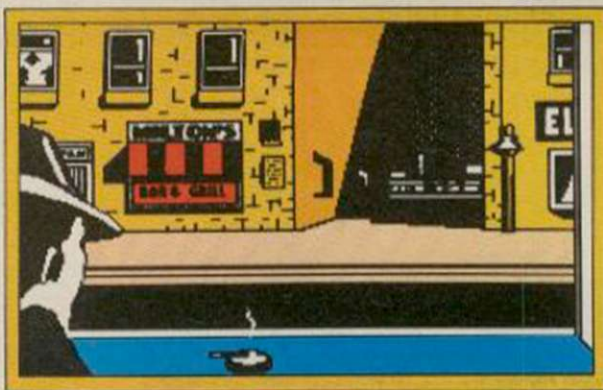
COMPETITION

If you want to win the new Sinclair QL in addition to putting in your sketch or photo you must complete this sentence in 12 words or fewer and send this coupon to Your Computer, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. I think the QL in Sinclair QL stands for

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Corsham,
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TEXT EDITOR

An "electronic notepad", which is easily updated with 12 "pages" — Julian Ossowski explains.



Listing 1.

```
10 LET L=0
20 LET A$="XXXXXX 32 X5 XXXXX"
30 LET L=USR 20495
40 IF L=1 THEN COPY
50 IF L=2 THEN LOAD A$
60 IF L=3 THEN SAVE A$
70 RUN
```

Listing 2.

```
99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N;" - ";
170 INPUT A$
180 PRINT A$;" = ";
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GO TO 310
290 PRINT "ERROR - PLEASE INPUT
AGAIN"
300 GO TO 150
310 NEXT N
```

BEING BORED with zapping space invaders, I decided to sit down and write a really useful ZX-81 program, and 'Textpro' was what I came up with. The program is essentially an electronic notepad, allowing access to an infinite number of screens which can easily be updated at any time. The program has the following features:

- Instant access to 12 "pages" stored in memory;
- Saving of pages on tape;
- Editor to write and update pages;
- Help page;
- Two display formats;
- Print function allowing pages to be dumped onto a printer;
- Scroll function for advertising displays etc.

Now onto the program itself, it is largely in Z-80 machine code, and has two parts, the first sets up the machine code, and then loads the second, which is the "slave" program used for storing pages on tape.

Type

POKE 16389,80

and then New, now type in listing 2 and Run it and so load in the machine code.

Now type New and create Rem lines 1-16 each 96 characters long — excluding the Rem — then type

POKE 16511,92 POKE 16512,6

to make one long line, then type

POKE 16510,0

to prevent it from being edited and

POKE 16514,118

and

POKE 16515,118

to prevent it from being listed. Now type
RAND USR 21658

to down load the machine code and save the Rem statement just in case something happens. Now type in the rest of listing 4, start the tape recorder on record and type run.

Type New and type in listing 3, save it just in case, and then Run it.

Command and Edit modes

Now load listing 4 from tape, add line 10 Rand USR 16962 and Run it after setting your tape recorder to record. This is now the complete master program. Now Break out of it.

Type New, type in listing 1, Run it, if all is well a message should appear, press "S", type
SLAVE

between the quotes, and then follow the instructions after pressing newline. This is the complete slave program.

There are two modes, Command and Edit. If you are ever stuck, and you are in Command mode, then if you press H you will get the help page. So after following the procedures above you will have just saved a blank page and you will be back in Command mode so if you press H you will get the help page, which will tell you how to use the system. If you want to type something, you have to go into Edit mode. To do this press shifted one, and a cursor and a message will appear. This editor is very much

(continued on page 167)

ELECTRON/ BBC MODEL 'B'

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ZX - SPECTRUM 48K

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Listing 3.

```

5 POKE 16418,0
10 PRINT
20 PRINT "EDITING"
30 PRINT "PRESS SHIFTED"
40 PRINT "EDIT MODE"
50 PRINT "USE THE CURSOR"
60 PRINT "KEYS AND RUBO"
70 PRINT "PRESS SHIFTED"
80 PRINT "A WHEN"
90 PRINT "YOU HAVE SHIF"
100 PRINT "STOPPING PAGES"
110 PRINT "ON TAPE; PRES"
120 PRINT "IN MEMORY; PR"
130 PRINT
140 PRINT "RETRIEVING PAGES"
150 PRINT "FROM TAPE; PR"
160 PRINT "FROM MEMORY;"
170 PRINT
180 PRINT "PRESS B TO SCROL"
190 PRINT "PRESS H FOR THIS"
200 PRINT "PRESS I TO INVER"
210 PRINT "PRESS U TO CLEAR"
220 PRINT "PRESS Z TO PRINT"
230 PRINT "HELP PAGE: - INFORMAT"
240 PRINT "ION"
250 RAND USR 21670
260 REM THIS INVERTS THE PAGE A
    ND STORES IT"

```

Listing 4.

```

1 REM *****
2 * J. OSSOWSKI 1984 *
3 * VERSION 4 *
4 *****
5
10 RAND USR 16962
20 SAVE "TEXTPRD"
30 RAND USR 17648
40 POKE 16389,80
50 CLS
60 PRINT AT 12,6;"TEXTPRD MAST"
70 PRINT AT 16,7;"STOP THE TAP"
80 PRINT AT 10,7;"PRESS ANY KE"
90 IF INKEY$="" THEN GOTO 90
100 CLS
110 PRINT AT 10,3;"PRESS J"
120 IF INKEY$<>"J" THEN GOTO 12
130 LOAD "

```

(continued from page 165)

like the 81's editor in that you can move the cursor around with shifted 5, 6, 7 and 8 and you can also use rubout.

You can store a page in memory by pressing M and then location 0 to 9 — there are two other pages which you can use for temporarily storing pages in: A and B. Retrieving pages is done by pressing R and then the page you want

— 0 to B. If you select a page other than 0 to B you will return to Command mode.

To save a page press S and then enter the file-name, and follow the instructions. It is a good idea to save the page in memory first in case you cause an input error e.g. rubbing out a quote gives an error.

To load a page, press J and then type the file-name — if you do not know this, then just press

newline.

If you press B you will scroll through all 12 pages at a moderate rate. If, however, you press any key then they will whizz past your face and you will return to Command mode.

There are a few bytes of system variables in front of the main machine code, one of them being SYSP — the current page number — which is mentioned in the listings.

Listing 5.

20495	E12200500C388500CD	= 955	20871	AEB4B38F80909C96	= 1254	21279	8480A8B8A8A8B8A8	= 1347
20503	0451FE2E2006CDEB	= 956	20879	A59180803030FFCD	= 1255	21287	80FFE12202501501	= 747
20511	S1C38350FE38200B	= 957	20887	0451D61C47E6F020	= 900	21295	1E01D5CDBA53E17E	= 1069
20519	CD2A0A3E80320450	= 958	20895	0678FE0CFAA751C9	= 1091	21303	D94FD93692CDBB02	= 1107
20527	C38850FE322006CD	= 959	20903	0411D60221425819	= 449	21311	444D511428F7CDB0	= 927
20535	6D51C38850FE3720	= 960	20911	10FD01D602ED580C	= 826	21319	077ECB7720280947	= 815
20543	06CD1A51C38850FE	= 961	20919	40EBED8000000000	= 712	21327	D9CDBA53E1D978D9	= 1470
20551	752006CD0653C388	= 779	20927	C92A0C4011005805	= 430	21335	77D11CD5CDBA53E1	= 1268
20559	50FE2D200CDD0051	= 901	20935	197EFE7628094F1A	= 677	21343	7ED94FD9CDBB022C	= 1077
20567	CD0451C0C051C388	= 1099	20943	777912132318F210	= 584	21351	20FA0619C506FF10	= 787
20575	50FE382009C0FE51	= 971	20951	FAC92A0C4001D702	= 787	21359	FED110F81880D947	= 1212
20583	3CFE01C23754FE2F	= 949	20959	09D11A13D5FEFFC6	= 1185	21367	D9CDBA53E1D978D9	= 1471
20591	2005C0FE51C38854	= 913	20967	772318F506182A0C	= 527	21375	77D978D9D1FE7320	= 1283
20599	FE3F20060101002A	= 401	20975	40237EFE762805C6	= 840	21383	011CFE7220067BFE	= 812
20607	0050E5C9FE27CCE2	= 1203	20983	807718F510F3C9CD	= 1181	21391	0128011DFE702086	= 475
20615	53CDD951A88482B2	= 1200	20991	D951AEB385B8B980	= 1331	21399	7AFE01280115FE71	= 806
20623	A6B3A9808E84H9HA	= 1336	20999	ABAEB1AAB3A6B2AA	= 1385	21407	200114FEE3220052A	= 613
20631	9980B2A6B80A830A6	= 1263	21007	80B48730AFB8B8B9	= 1349	21415	0250E5C9FE772003	= 925
20639	80A80B4A8A8A8A80	= 1269	21015	80B3A8BCB1AEB3AA	= 1365	21423	36007BFE0128011D	= 502
20647	808080807685A6AC	= 1149	21023	8080760000000000	= 374	21431	D518A9C1D1C57BFE	= 1382
20655	AA808080808080AF	= 1110	21031	0000000000000000	= 0	21439	2020091E01147AFE	= 500
20663	98B48B8848C8B880	= 1431	21039	0000000000000000	= 0	21447	16200115D5422A0C	= 409
20671	AE808080DA5A4A080	= 1204	21047	0000000000000000	= 0	21455	40231121001910FD	= 443
20679	8080808080FF3A04	= 957	21055	000000FF06002A10	= 319	21463	D1D5160019C1C1D5	= 1084
20687	502A0C4001FE0209	= 454	21063	407EFE4628052310	= 610	21471	E5C5C9CD0951B8A8	= 1482
20695	77C3165000000000	= 416	21071	F8CF1E2A0C4011F8	= 866	21479	87B4B1B18080B587	= 1337
20703	0000000000000000	= 0	21079	0219360B23360B55	= 421	21487	A888888888888888	= 1329
20711	0000000000000000	= 0	21087	CD0451E1C877200A	= 870	21495	80A8888888888888	= 1327
20719	0000000000000000	= 0	21095	77237EFE76280EE2B	= 953	21503	88A8A88888A80FF21	= 1285
20727	0000000000000000	= 0	21103	18EBFE77200B3600	= 729	21511	185801F300C5E5ED	= 1022
20735	0000000000CDBB02	= 394	21111	2B7EFE76280DF2318	= 855	21519	580C4001D602ED0B	= 797
20743	444D511428F7CDB0	= 927	21119	DCFE76280D32A0C40	= 958	21527	CD88022C20080119	= 504
20751	077EF5CD88022C20	= 848	21127	11F602197EFE0B23	= 723	21535	1908738120FBE101	= 842
20759	FAF1C93E80320450	= 1018	21135	47CDD9512A373734	= 778	21543	210009C10878B120	= 575
20767	CD0951B7A8B97AE	= 1398	21143	378E1600322E3838	= 259	21551	DDCDBB022C2800C9	= 1107
20775	A8B8A880808CADAE	= 1318	21151	2E332C00363A3439	= 362	21559	010300C518040182	= 232
20783	A8AD80B184A8A8B9	= 1345	21159	2A1A00393C352A00	= 282	21567	00C5CDD95188B9A6	= 1235
20791	AEB4B38F80909C96	= 1254	21167	373A330076000000	= 282	21575	87B98089A888A8A9	= 1352
20799	A59180FFCD0451D6	= 1197	21175	0000000000000000	= 0	21583	8089AD8A8380B587	= 1327
20807	047E5F0200678FE	= 981	21183	0000000000000000	= 0	21591	A8B8888888888888	= 1329
20815	0CFA5451C00411D6	= 863	21191	0000000000000000	= 0	21599	80A8A88888FFCD04	= 1256
20823	022142581910FD01	= 484	21199	0000000000FFC019	= 487	21607	51C12A00505C921	= 859
20831	D602ED580C40EDB0	= 1033	21207	23E506017EFE0B23	= 702	21615	324011005001FF04	= 551
20839	C69C320450C93E80	= 879	21215	0704C86820A82318	= 580	21623	ED802A0C40110058	= 636
20847	320450CDD951B889	= 1006	21223	F32A1040237EFE46	= 550	21631	011903EDB0C2A0A	= 699
20855	B4B7A88080BCADAE	= 1324	21231	20FA23783D280B77	= 568	21639	060C111858C501D6	= 562
20863	A8AD80B184A8A8B9	= 1345	21239	3232D11A77231310	= 494	21647	022A0C40EDB000C1	= 726
			21247	FAC936000109CDD9	= 1037	21655	10F3C92100501182	= 720
			21255	51A8A8A8B980B2B4	= 1265	21663	40010006EDB0C9CD	= 890
			21263	A9A8808088587A88	= 1313	21671	EB511100582A0C40	= 539
			21271	B88088888848580B9	= 1355	21679	011903EDB0C9 = 643	

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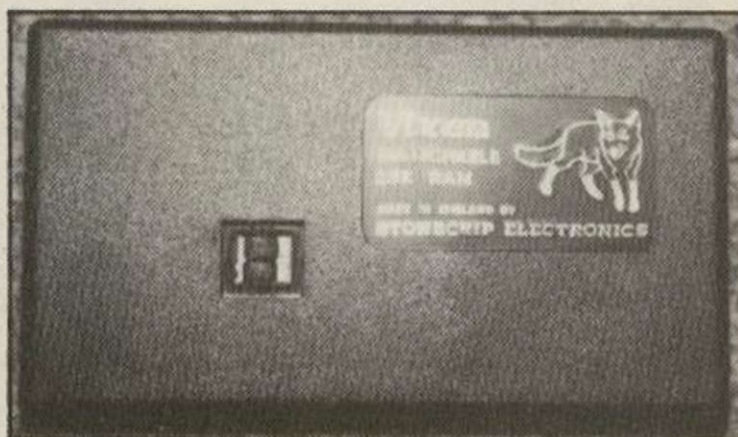
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Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

VIC MEMORY

I have a Vic with 32K RAM fitted. I wish to leave the 32K in place all the time. Is this possible? Can the Vic be re-directed to accept programs which require no extension; for those programs which need 3K extra; for those which demand 8K; and for those which need 16K? I am a complete newcomer to computers and hope you can help.

C B Wood,
Cneadle Hulme,
Cheshire.

THIS IS RELATIVELY easy to do. You need only enter the following directly, or make it the first line of a program, and you can fool your Vic into thinking it has whatever memory you want.

Standard memory — POKE 642,16:
POKE 644,30:POKE 648,30:SYS
64824

Plus 3K — POKE 642,4:POKE 644,
30:POKE 648,30:SYS 64824

Plus 8K — POKE 642,18:POKE 644,
64:POKE 648,16:SYS 64824

Plus 16K — POKE 642,18:POKE
644,96:POKE 648,16:SYS 64824

Plus 24K — POKE 642,18:POKE
644,128:POKE 648,16:SYS 64824

QL MICRODRIVE

I have bought a Microdrive for my Spectrum and am gradually transferring my programs from cassette to Microdrive. Will I be able to run these on a QL if I buy one?

Geoffrey Fraser,
Dartford, Kent.

NO. THE MICRODRIVES on the QL are improved versions of the Spectrum ones, holding 100K compared with the Spectrum 85K. As well, QL SuperBasic is incompatible with Spectrum Basic.

RUN/STOP STOP

Is there any way of turning off the Run/Stop key on my Commodore 64 while a program is running? I would like you to tell me how this can be done.

G Dartin,
Arbouthorne.

THERE IS A way of doing it using a Poke and a Peek, but it has the disadvantage of turning off the internal clock as well.

POKE 788,PEEK(788)+3
will disable the Run/Stop key and
POKE 788,PEEK(788)-3
will turn it on again.

GRAPHIC PROBLEM

I am a very interested reader of *Your Computer* magazines but I have a problem. I bought a 48K Spectrum last year and decided to type in some programs from back issues of the magazine. The ones I tried were

Balloon Hopper and Star Wars. However, I don't know how I must type and what I must do to get the user graphics needed in the Basic program. Could you help me? I found these programs very attractive.

Daniel Janssens,
Belgium.

THE GRAPHICS referred to, in these and similar programs, are produced by redefining a set of up to 21 letters from the Spectrum's character set. You get into graphics mode by holding down Caps Shift and pressing the Graphics key — the 9 key. Then, if the A has been re-defined, you get the relevant graphic each time you pressed the A key, while in graphics mode. You can tell you are in graphics mode because the cursor becomes a G. You will find a full explanation of how to create these in your Spectrum manual, chapter 14, pages 67 to 73.

VARIABLE PEEK

I bought a Spectrum recently and would like to find out what is actually happening in its variables area. I have tried the following statements which unfortunately failed to dump all variables to the screen:

```
10 FOR X = 0 TO nn
20 PRINT CHR$(PEEK(PEEK 23627
+ 256*PEEK 23628 + X))
30 NEXT X
```

Would you please explain some way to let the program variables be revealed?

P Lee,
Seven Sisters Road,
London N4.

YOU HAVE ALMOST got it right. The variables begin at 23627 — so you are right about that — but the second line of your program is incorrect. To find out what is happening, where X is the address, you need to get the value

```
PEEK X + 256*(PEEK(N + 1))
Therefore, the state of an address, in
terms of your program, can be found
by changing line 20 of the program
to:
```

```
20 PRINT PEEK (23627 + X) + 256*
PEEK(23628 + X)
```

You also need to add Step 2 to the end of line 10.

SPECTRUM VERIFY

I own a 48K Spectrum and I have encountered a major problem when trying to include a Verify routine within a program. The routine usually prints up: "Do you wish to Verify 'name'?" If I answer Yes, the computer prints up "Rewind tape recorder and press any key", followed by a line Verify "name". I always get an R Tape loading error with the line

number of the line Verify "name"! I have tried many different ways of programming such a routine and have yet to find success. Can you help?

U Schoke,
Aachen-lau.

AS FAR AS I CAN determine, you are not able to use Verify within a program. It is designed to be used in the direct mode only. I cannot see why it should not work within a program, as the other tape storage commands, Load, Save and Merge, can all be accessed by calls within a program. However, I cannot make it work; you cannot make it work; the manual gives no indication that it should work; so I suppose it is not going to happen. I would be pleased to hear from anyone who has a way of doing it, so I can pass the information on.

CABLE TROUBLE?

I am considering moving house and, of course, taking my Spectrum with me. However, the new house has some overhead power cables very close to it. Would these power cables and their magnetic field have any effect on my computer? They are not national grid lines, but they do carry most of Swindon's power and are about 500 yd. from the house. I would be grateful if you could publish the answer to this rather worrying question.

P K Brown,
Blunsdon,
Swindon.

I HAVE NEVER heard of problems being encountered in a situation such as you describe. The only vaguely similar situation I have come across is the owner of a ZX-81 who lived next door to a CB enthusiast, who found his ability to load and save was severely restricted when the neighbour's rig was in action. Fluctuating massive power surges could pose a problem, but you are most unlikely to suffer from them in your situation. If you have any problems, which I consider extremely unlikely, you could minimise them by keeping all leads as short as possible, and perhaps using battery power on your cassette recorder.

ORIC LOADING

I have had an Oric now for three months, and have tried it with three different cassette recorders. The loading has not been reliable on any of them. Should I buy the computer-compatible cassette machine I have seen advertised?

David Hunt,
Finsbury Park, N4.

FROM WHAT I have read about one such cassette recorder they do not seem significantly better than other recorders which cost about the same. Clive Gifford, author of a book on the Oric, suggests you set your volume on about 30 percent of maximum and tone around 80/90 percent. The Oric is sensitive to volume and tone changes, so this

should give you a starting point. Check your cassette leads. Undo the casing of your plugs carefully, and check for a loose or poor connection. Keep the recorder heads clean, using a fluid cleaner rather than a head-cleaner tape — these tend to treat your heads harshly. Use C-15 or C-12 computer tapes, rather than ordinary audio ones, or if you must use audio ones, stick to C-60 or shorter and buy the highest quality you can afford. It is best to erase the tape before you record another program over it. Try to keep, in a safe place, a tape which always loads perfectly. If, at some time in the future, you experience a series of loading problems, you can check using your perfect tape to try and work out if it is the computer which is causing the problem. Incidentally, these suggestions apply to loading programs on most computers which use cassettes, although some are not as volume-sensitive as the Oric.

A GOOD BUY?

Having closely inspected the review of the Electron in *Your Computer* — September 1983 — I am seriously reconsidering buying the BBC Micro Model B. I am not particularly interested in interfacing the computer to anything apart from another processor sometime in the future. Is the extra £200 really worth paying?

Robert Lyle,
Alva,
Clacks.

MANY PEOPLE HAVE decided that buying an Electron and then upgrading it gradually so that it is, in effect, a BBC Micro is a sensible way to proceed. It will never be quite the same as a BBC Micro — no Mode 7, only a single sound channel — but for almost everything else you will probably be able to buy whatever you need to modify it.

SOUND OF MUSIC

I have recently bought myself an Oric and although I have no trouble with the built-in sound commands like Ping and Zap, I am confused about the use of Sound and Music.

Andrew Peterson,
Guildford, Surrey.

THE MUSIC COMMAND is good for music, and while you can still make music with Sound, you will find this is best for sound effects. The Oric, flexible beast that it is, also has a Play command which is good for sound effects. Music is followed by four numbers, which can also be previously-assigned variables, which control channel 1, 2 or 3 — octave — 0 to 6 — note — 1 to 12 — and volume — 0 to 15. Sound is followed by three numbers which are channel — 1 to 3 as in Music for music, 4 to 6 for noise — period — the length of the note 0 to 32767 — and volume, as in Music. Play is much more complicated, with four numbers following the command: tone enable — 0 to 7 — noise enable — 0 to 7 — envelope — 1 to 7 — and period. ■

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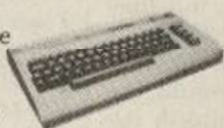
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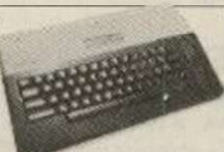
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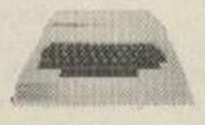
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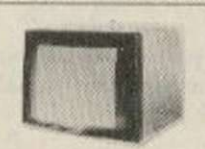
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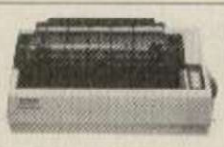


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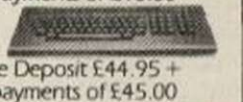
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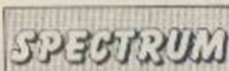
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Clyde W Bish,
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THIS PROGRAM MAKES use of the excellent 3D Graphics Rotation program by Mark Jones — YC July. It simulates bringing a spacecraft into visual range of a satellite using a radar screen system, then using a visual/instrument display docking with the object. The satellite is displayed as a simple cube with a cross on the front face. This could be elaborated with extra data statements — there is room purposely left above RAMtop for this — but it would slow down the graphic draw routine. In the program information which follows I have included the machine code listing in decimal as the original listing contained some errors which were corrected in subsequent issues of your magazine. The game is for the 48K machine although the 16K version of the machine code is used as space is needed to hold the screen bytes.

Type in program 1 and Run. Enter the numbers in table A. This is the machine code routine. If you already have the 16K version of the original program on tape

CLEAR 30999, LOAD "name" CODE 31000 and Run 4. You have two checks for accuracy available. Each entry is displayed on screen

after it is Entered, and a check number appears at the end of the Inputs. This should be 84840. Any other number means you have made a mistake.

If all is well, press Cont and Enter. The program will now construct the sine table, and data table above RAMtop, then draw the cockpit display. When this is complete the D File bytes are loaded above RAMtop. Whilst all this is going on make yourself a cup of coffee and recover from entering umpteen machine bytes without making a mistake!

The option to Save the code then follows. Use this if you do not intend to type in the main program now. Otherwise Break and New the machine. Don't worry — your precious code is safe above RAMtop — and type in program 2. Before you try your skill as a shuttle pilot Save the whole program using SAVE "dock" LINE 6110:SAVE "d" CODE 31000, 10144

and verify using

VERIFY " " : VERIFY " " CODE

If you have previously Saved the code Load it into the machine using.

CLEAR 30999 : LOAD " " CODE before Saving as above.

When you Load in the program it will auto-start and Load in the code before starting the display. If you want to play having just typed it in use Run 6115.

The first display is of your craft and the satellite in orbit. You must guide your craft to

superimpose the two images using the 6 key to bring it into a tighter, faster orbit, and 7 to move into a wider, slower orbit. Each move uses up 10 fuel units. The read-out of the fuel remaining and difference in the two orbits is given at bottom left of screen.

When you have superimposed the images the second part of the task begins. You are given a view of the satellite — at random attitude and position — through the viewport plus a readout of the current docking status and thruster control in operation at top left of screen, and a read-out of the control attitudes status, thrust level, and remaining fuel at bottom right.

The control keys are:

P & O = pitch to front or back
Y & T = yaw to right or left
R & E = roll to right or left
U & D = move up or down
F & B = move forward or back
M & N = move right and left

Use these to select your thruster, then press a number 1-9 to select the power of the thrust. High values are less wasteful of fuel, but you are more likely to overshoot! Cancel the thrust using the opposing thruster e.g., B cancels F. You have to get all the read-outs of control attitude status, except F-B, to 0 before moving in to dock. Your final thrust speed must be between 4 and 6 inclusive and F-B must end at 0. If all attitudes do not end 0, or you come in too fast you will crash. If you come in too slowly you will not close the docking latches, but will see the satellite bounce off. You may try again, but be careful not to run out of fuel! Pressing 0 will play again.

The capital letters in program 1, lines 6019, 6020, 6022, 6027, and program 2, lines 6020, 6040 and 6050 are user-defined graphics and should be entered in the Graphics mode.

Program 1.

```

2 POKE 23609,50: CLEAR 30999:
LET t=0: FOR n=31000 TO 31684:
INPUT 1: LET t=t+1: POKE n,1: PR
INT n: PEEK n: NEXT n: PRINT "che
ck=";t: STOP
4 POKE 31724,0: POKE 31725,12
5: POKE 31721,3
10 FOR f=0 TO 180: LET c=INT (
256*3.14159/(360*f))
15 IF c=255 THEN LET c=255
20 POKE f+31730,c: NEXT f
100 DATA 20,-20,20,0,20,-20,-20
,1,-20,-20,-20,1,-20,-20,1,20
,-20,20,1,20,20,20,1,20,20,1
,-20,20,-20,1,-20,20,20,1,20,20
,20,1,20,-20,-20,20,20,1,-20,1
,-20,-20,-20,20,-20,1,-20,-20
,20,0,-20,20,20,1
110 DATA 0,-10,20,0,0,10,20,1,1
0,0,20,0,-10,0,20,1
1000 RESTORE 100: LET v=20
5000 FOR f=1 TO v: READ x,y,z,p
5001 IF x<0 THEN LET x=-x+255
5002 IF y<0 THEN LET y=-y+255
5003 IF z<0 THEN LET z=-z+255
5010 POKE 31995+f*4,x: POKE 3199
7+4*f,y: POKE 31998+4*f,z: POKE
31999+4*f,p: NEXT f
5015 POKE 31699,v
6000 PAPER 0: CLS : INK 7: PLOT
0,0: DRAW 175,175,-(PI/2): FOR n
=0 TO 175: LET c=0
6005 IF POINT (c,n)=1 THEN GO TO
6010
6010 PLOT c,n: LET c=c+1: GO TO
6005
6015 NEXT n
6019 INVERSE 1: RESTORE 6032: LE
T u=32: LET x=4: FOR n=1 TO 11:
READ a: FOR j=0 TO 7: READ a: P
OKE USA a+j,a: NEXT j: NEXT n
6020 FOR n=10 TO 20: PRINT AT n,
21;"D": E: NEXT n: PRINT
AT 12,21;"ABBBBBBBBBB": AT 21,21:
"FGGGGGGGGGH"
6022 INVERSE 0: PRINT AT 21,0;"I
": AT 0,31;"J": AT 11,31;"K": AT 21
,20;"K"
6025 PLOT 180,95: DRAW 0,-17: DR
AW -17,0
6027 PRINT AT 0,0: INVERSE 1:"AB
BBBBBB": AT 1,0:"D": E: AT 2
,0:"FGGGGGGGH": AT 4,1:"ABC": AT 5
,1:"D": E: AT 6,1:"FGH"
6032 DATA "a",0,0,63,"w","w","w","
b",0,0,255,0,0,0,0,"c",0,0,252
,4,4,4,4,4,"d","w","w","w","w","
e",4,4,4,4,4,"d","w","w","w","w","
f",0,0,0,9,0,0,0,0,0,255,0,0,"h
",4,4,4,4,4,252,0,0,"i",120,120
,120,120,120,192,224,240,"j",31,7
3,1,1,0,0,0
6033 DATA "k",0,0,0,1,1,3,7,31

```

Program 2.

```

1 IF v<0 THEN LET v=v+65535
2 LET a=INT (v/255): LET b=IN
T (255*(v/255-a)): POKE d,b: POK
E d+1,a: LET d=d+2: RETURN
3 POKE 31725,125: POKE 23658,
0
4 BORDER 7: FOR f=1 TO 2: PAP
ER 0: CLS : INK 7: NEXT f: LET t
h=0: LET c="DOCKING": LET b="
": LET t=0
5 LET px=INT (RAND*10+10): LET
py=INT (RAND*40+40): LET pz=INT
(RAND*50+50)
7 LET phi=INT (RAND*360): LET
psi=INT (RAND*360): LET theta=INT
(RAND*360)
2000 LET a$=INKEY$: IF a$="" THE
N LET a$="b"
2001 IF t THEN LET th=INT (th+
9.417): LET fu=INT (fu-9.417)
2002 IF a$="0" AND a$<"9" THEN
LET t=VAL a$: LET fu=fu-t: LET
a$="b"
2003 IF a$="U" AND b$="D" OR a$=
"D" AND b$="U" OR a$="M" AND b$=
"N" OR a$="N" AND b$="M" OR a$="
F" AND b$="B" OR a$="B" AND b$="
F" OR a$="P" AND b$="O" OR a$="O
" AND b$="P" OR a$="Y" AND b$="T
" OR a$="T" AND b$="Y" OR a$="R
" AND b$="E" OR a$="E" AND b$="R
" THEN LET fu=fu-th: LET th=0: LE
T t=0
2010 LET b$=a$: LET px=px+ts(a$
="N")-ts(a$="M")
2020 LET py=py+ts(a$="U")-ts(a$
="D")
2030 LET pz=pz+ts(a$="B")-ts(a$
="F")
2040 LET theta=theta+ts(a$="T")-
ts(a$="Y")
2050 LET psi=psi+ts(a$="R")-ts(a
$="E")
2060 LET phi=phi+ts(a$="O")-ts(a
$="P")
2080 IF theta>360 THEN LET thet
a=theta-360
2090 IF psi>360 THEN LET psi=ps
i-360
3000 IF phi>360 THEN LET phi=ph
i-360
3010 IF theta<0 THEN LET theta=t
heta+360
3020 IF phi<0 THEN LET phi=phi+3
60
3030 IF psi<0 THEN LET psi=psi+3
60

```

```

3040 IF pz>255 THEN LET pz=255
3050 LET v=px: LET d=31706: GO 5
UB 1: LET v=py: GO SUB 1: LET v=
pz: GO SUB 1
3052 LET d=31712: LET v=phi: GO
SUB 1: LET v=theta: GO SUB 1: LE
T v=psi: GO SUB 1
3054 RANDOMIZE USA 31635
3056 PRINT AT 1,1,c$: AT 5,2: INV
ERSE 1;a$: AT 13,22;"L-R": AT 19
,AT 14,22;"U-D": AT 15,22;"F-B
": AT 16,22;"Pitch": AT 17,22;"Yaw
": AT 18,22;"Roll": AT 19,22;"Thrust
": AT 20,22;"Fuel": AT 21,22;"Fue
l": GO TO 5000
3060 IF fu<1 THEN LET c$="NO FUE
L": GO TO 5000
3065 LET p=0: IF phi=180 AND psi
=0 AND theta=0 AND px=-19 AND py
=83 THEN LET p=1
3070 IF pz<-109 OR pz=-109 AND p
<1 OR pz=-109 AND p=1 AND t>5 T
HEN LET c$="CRASHED": GO TO 5000
3080 IF pz=-109 AND p=1 AND t<7
AND t>3 THEN LET c$="DOCKED": G
O TO 5000
3090 IF pz=-109 AND p=1 AND t<4
THEN LET c$="NO DOCK": LET R=INT
(RAND*10+1): FOR N=1 TO R AND 5+5
LET pz=pz+r*2: LET theta=theta+r
: LET psi=psi+r*2: LET phi=phi+r
: GO SUB 2050: NEXT n: GO TO 50
00
3099 GO TO 2000
5010 PRINT AT 1,1: FLASH 1;c$: I
F c$="NO DOCK" THEN LET c$="DOCK
ING": LET b$="": GO TO 2000
5020 GO TO 9000
6000 BORDER 1: PAPER 7: CLS : IN
K 0: LET fu=999: LET r1=INT (RAN
D*5)+3: LET r2=INT (RAND*6)+3: LE
T a1=0: LET a2=PI: LET h=0
6010 PRINT AT 19,0: INK 1:"
": AT 20,0: INK 0:"Fuel":
fu: INK 1:"": AT 21,0: INK 0:"
": AT 22,0: INK 1:"Fuel":
fu: INK 1:"": AT 23,0: INK 0:"
": AT 24,0: INK 1:"Fuel":
fu: INK 1:"": AT 25,0: INK 0:"
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": AT 318,0: INK 1:"Fuel":
fu: INK 1:"": AT 319,0: INK 0:"
": AT 320,0: INK 1:"Fuel":
fu: INK 1:"": AT 321,0: INK 0:"
": AT 322,0: INK 1:"Fuel":
fu: INK 1:"": AT 323,0: INK 0:"
": AT 324,0: INK 1:"Fuel":
fu: INK 1:"": AT 325,0: INK 0:"
": AT 326,0: INK 1:"Fuel":
fu: INK 1:"": AT 327,0: INK 0:"
": AT 328,0: INK 1:"Fuel":
fu: INK 1:"": AT 329,0: INK 0:"
": AT 330,0: INK 1:"Fuel":
fu: INK 1:"": AT 331,0: INK 0:"
": AT 332,0: INK 1:"Fuel":
fu: INK 1:"": AT 333,0: INK 0:"
": AT 334,0: INK 1:"Fuel":
fu: INK 1:"": AT 335,0: INK 0:"
": AT 336,0: INK 1:"Fuel":
fu: INK 1:"": AT 337,0: INK 0:"
": AT 338,0: INK 1:"Fuel":
fu: INK 1:"": AT 339,0: INK 0:"
": AT 340,0: INK 1:"Fuel":
fu: INK 1:"": AT 341,0: INK 0:"
": AT 342,0: INK 1:"Fuel":
fu: INK 1:"": AT 343,0: INK 0:"
": AT 344,0: INK 1:"Fuel":
fu: INK 1:"": AT 345,0: INK 0:"
": AT 346,0: INK 1:"Fuel":
fu: INK 1:"": AT 347,0: INK 0:"
": AT 348,0: INK 1:"Fuel":
fu: INK 1:"": AT 349,0: INK 0:"
": AT 350,0: INK 1:"Fuel":
fu: INK 1:"": AT 351,0: INK 0:"
": AT 352,0: INK 1:"Fuel":
fu: INK 1:"": AT 353,0: INK 0:"
": AT 354,0: INK 1:"Fuel":
fu: INK 1:"": AT 355,0: INK 0:"
": AT 356,0: INK 1:"Fuel":
fu: INK 1:"": AT 357,0: INK 0:"
": AT 358,0: INK 1:"Fuel":
fu: INK 1:"": AT 359,0: INK 0:"
": AT 360,0: INK 1:"Fuel":
fu: INK 1:"": AT 361,0: INK 0:"
": AT 362,0: INK 1:"Fuel":
fu: INK 1:"": AT 363,0: INK 0:"
": AT 364,0: INK 1:"Fuel":
fu: INK 1:"": AT 365,0: INK 0:"
": AT 366,0: INK 1:"Fuel":
fu: INK 1:"": AT 367,0: INK 0:"
": AT 368,0: INK 1:"Fuel":
fu: INK 1:"": AT 369,0: INK 0:"
": AT 370,0: INK 1:"Fuel":
fu: INK 1:"": AT 371,0: INK 0:"
": AT 372,0: INK 1:"Fuel":
fu: INK 1:"": AT 373,0: INK 0:"
": AT 374,0: INK 1:"Fuel":
fu: INK 1:"": AT 375,0: INK 0:"
": AT 376,0: INK 1:"Fuel":
fu: INK 1:"": AT 377,0: INK 0:"
": AT 378,0: INK 1:"Fuel":
fu: INK 1:"": AT 379,0: INK 0:"
": AT 380,0: INK 1:"Fuel":
fu: INK 1:"": AT 381,0: INK 0:"
": AT 382,0: INK 1:"Fuel":
fu: INK 1:"": AT 383,0: INK 0:"
": AT 384,0: INK 1:"Fuel":
fu: INK 1:"": AT 385,0: INK 0:"
": AT 386,0: INK 1:"Fuel":
fu: INK 1:"": AT 387,0: INK 0:"
": AT 388,0: INK 1:"Fuel":
fu: INK 1:"": AT 389,0: INK 0:"
": AT 390,0: INK 1:"Fuel":
fu: INK 1:"": AT 391,0: INK 0:"
": AT 392,0: INK 1:"Fuel":
fu: INK 1:"": AT 393,0: INK 0:"
": AT 394,0: INK 1:"Fuel":
fu: INK 1:"": AT 395,0: INK 0:"
": AT 396,0: INK 1:"Fuel":
fu: INK 1:"": AT 397,0: INK 0:"
": AT 398,0: INK 1:"Fuel":
fu: INK 1:"": AT 399,0: INK 0:"
": AT 400,0: INK 1:"Fuel":
fu: INK 1:"": AT 401,0: INK 0:"
": AT 402,0: INK 1:"Fuel":
fu: INK 1:"": AT 403,0: INK 0:"
": AT 404,0: INK 1:"Fuel":
fu: INK 1:"": AT 405,0: INK 0:"
": AT 406,0: INK 1:"Fuel":
fu: INK 1:"": AT 407,0: INK 0:"
": AT 408,0: INK 1:"Fuel":
fu: INK 1:"": AT 409,0: INK 0:"
": AT 410,0: INK 1:"Fuel":
fu: INK 1:"": AT 411,0: INK 0:"
": AT 412,0: INK 1:"Fuel":
fu: INK 1:"": AT 4
```


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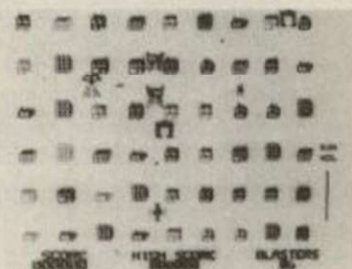
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airmail postage.

(continued from page 171)

```
T U1,X1,A$: IF X1=X2 AND Y1=Y2 T
HEN GO TO 6100
6050 PRINT AT Y2,X2;"I": IF INKEY$
Y$="6" THEN LET R1=R1-1: LET YU=
YU-10
6060 IF INKEY$="7" THEN LET R1=R
1+1: LET YU=YU-10
6070 PRINT AT 21,9,ABS (R1-R2);A
T 20,5+(YU-100);A$: YU: LET YU=Y
1: LET X8=X1: LET Y8=Y2: LET X9=
X2: IF R1>10 THEN LET R1=10
6075 IF YU=0 THEN PRINT AT 10,12
: BRIGHT 1: FLASH 1:"NO FUEL": G
O TO 9000
6080 IF R1<1 THEN LET R1=1
6090 LET H=H+1: GO TO 6020
6100 PRINT AT Y1,X1,A$: AT Y1,X1,
OVER 1:"I": PRINT AT 0,3: FLASH
1: BRIGHT 1:"SATELLITE IN VISUA
L RANGE": FOR N=1 TO 500: NEXT N
: GO TO 3
6110 CLEAR 30999: LOAD ""CODE
6115 RESTORE 6115: FOR N=USR "z"
TO USR "j":+7: READ A: POKE N,A:
NEXT N: GO TO 6000: DATA 0,252,
254,103,103,254,252,0,24,20,252,
230,103,63,31,14,102,126,126,102,
102,126,60,24,12,126,63,103,230,
252,240,112,0,63,127,230,230,127,
63,0,112,240,252,230,103,63,28,
12,24,60,126,102,102,126,126,102,
14,31,63,103,230,252,55,48,0,0,
0,24,24,0,0,0,60,126,126,126,1
26,60,0
9000 PRINT #0:"PRESS 0 TO PLAY A
GAIN": PAUSE 0: IF INKEY$="0" T
HEN GO TO 9000
9010 GO TO 6000
```

Table A.

```
62 128 50 232 123 17 0 1
42 216 123 205 85 121 34 216
123 34 230 123 175 50 232 123
17 0 0 42 212 123 235 205
85 121 17 128 0 205 178 121
34 212 123 17 87 0 42 214
123 213 205 85 121 209 205 178
121 34 214 123 201 175 235 237
82 203 124 196 194 121 68 77
58 232 123 143 56 4 237 75
230 123 229 197 235 33 0 0
205 156 121 48 22 175 225 209
```

```
188 32 1 235 205 147 121 68
77 33 0 0 205 156 121 205
147 121 201 6 8 205 149 121
209 209 201 6 4 203 60 203
29 16 250 201 203 56 203 25
48 2 25 216 40 6 235 41
216 235 24 240 120 254 0 200
24 244 235 58 232 123 203 63
48 5 25 50 232 123 201 237
82 201 213 235 175 103 111 237
82 58 232 123 60 50 232 123
209 201 31 48 15 1 90 0
9 229 1 104 1 237 66 56
2 193 229 225 229 175 1 180
0 237 66 56 4 62 1 193
229 225 50 232 123 1 242 123
9 78 6 0 237 67 230 123
235 205 89 121 201 197 229 245
205 210 121 58 232 123 31 220
194 121 241 60 209 193 245 229
235 80 89 205 210 121 58 232
123 31 220 194 121 209 241 31
48 2 25 201 235 237 82 201
42 226 123 237 91 212 123 237
75 216 123 229 213 197 62 1
205 5 122 34 212 123 193 209
225 175 205 5 122 229 193 42
224 123 237 91 214 123 229 213
197 175 205 5 122 34 216 123
193 209 225 62 1 205 5 122
229 193 42 228 123 237 91 212
123 229 213 197 62 1 205 5
122 34 212 123 193 209 225 175
205 5 122 34 214 123 201 42
212 123 237 91 238 123 14 1
175 237 82 203 124 40 6 38
0 149 111 13 13 69 197 42
214 123 237 91 240 123 6 1
```

```
175 237 82 203 124 40 4 149
111 5 5 209 74 80 69 217
229 217 121 184 48 6 105 213
175 95 24 8 177 40 59 104
65 213 22 0 96 120 31 133
56 3 188 56 7 148 79 217
193 197 24 4 79 213 217 193
42 240 123 121 72 5 40 1
4 9 34 240 123 42 238 123
79 71 5 40 1 4 9 34
238 123 205 6 123 217 121 16
206 209 217 225 217 201 175 42
238 123 188 192 77 42 240 123
188 192 62 175 149 216 71 205
177 34 71 4 62 1 15 16
253 70 253 203 87 94 40 4
47 160 119 201 176 119 201 58
233 123 31 48 25 31 1 0
24 17 0 64 48 7 42 234
123 237 176 24 9 33 203 36
43 237 160 234 72 123 237 75
210 123 42 236 123 197 175 87
94 203 123 40 1 21 237 83
212 123 87 35 94 203 123 40
1 21 237 83 214 123 87 35
94 203 123 40 1 21 237 83
216 123 35 229 205 48 122 237
91 218 123 42 212 123 41 25
34 212 123 237 91 220 123 42
214 123 41 25 34 214 123 237
91 222 123 42 216 123 25 34
216 123 205 24 121 225 126 35
229 31 56 17 42 212 123 34
238 123 42 214 123 34 240 123
205 6 123 24 3 205 135 122
225 193 16 145 201 0 0 0
```

CHECK = 84840

Guitar Player

Richard Adams,
Milton Keynes,
Buckinghamshire.

CBM-64

WHEN THE PROGRAM is run the computer reads data in for the chord shapes on a guitar. Then you will be shown the frets of a guitar on the screen. By pressing the letter C on the keyboard the computer will play the chord of C using the same notes as a guitar and will

also print the chord shape on to the screen.

This program will work with seventh and minor chords and also sharps. Instructions appear on the screen also. Here is a description of the program.

```
10 GOSUB150
20 P1=PEEK(197)-10:P2=PEEK(653)
30 IF P1>18 THEN 20
40 IF P2>3 THEN P2=P2-A
50 N$=V$(P2,P1)
60 PRINT "CHORD: "FOR I=ZTO7:PRINT "XHHHHHHHHH":NEXT
70 POKES+4,S0
80 FOR I=ATOLEN(N$):N=VAL(MID$(N$,I,A))
90 POKES+A,CH(I-A,N):POKES,CL(I-A,N)
100 IF N=Z THEN 120
110 X=L*N+B+I*B-A:POKECO+X,BC:POKESC+X,BA
120 NEXT
130 POKES+4,SZ:POKES,Z:POKES1,Z
140 GOTO20
150 I=0:J=0:Z=0:A=1:SC=1064:CO=55336:B=2:L=40:BA=81:BC=5:SZ=32:S0=33:P1=0:P2=0
160 S=54272:FOR I=STOS+24:POKEI,0:NEXT
170 POKES+24,15:POKES+5,SZ-1
180 DIMN(6),Y$(6,18),CH(3,8),CL(3,8)
190 POKE53280,0:POKE53281,0
200 POKE646,15
210 PRINT "J"
220 FOR I=ZTO6:READN(I)
230 FOR J=ZTO5:READY$(J,N(I)):NEXT:NEXT
240 FOR I=ZTO5:FOR J=ZTO8:READCH(I,J),CL(I,J):NEXTJ,I
250 PRINTTAB(13)"XXXXXXXXXXXX"SHIFT' GIVES SEVEN CHORDS
260 PRINT:PRINTTAB(13)"CTRL' GIVES SHARP CHORDS
270 PRINT:PRINTTAB(13)"CBM' GIVES MINOR CHORDS
280 PRINT "E A D G B E"
290 PRINT "
300 FOR I=1TO10:PRINT "||| | | | | |"
310 PRINT "H + + + + + H"
320 NEXT
330 RETURN
1000 DATA10,332010,032310,335543
1010 DATA446664,446464,446654
1020 DATA8,200232,200212,100231
1030 DATA668886,668686,668876
1040 DATA4,022100,020130,022000
1045 DATA022100,020130,022000
1050 DATA11,133211,131211,133111
1060 DATA244322,242322,244222
1070 DATA16,320003,320001,355333
1072 DATA466544,464544,466444
1074 DATA0,002220,002020,002210
```

(continued on next page)

- 20 to 140 contain the main program. This is at the start in order to make the program run as fast as possible.
- 20 looks at locations 197 and 653 which tell the computer which chord to play and whether it is a sharp, seventh or minor.
- 50 N\$ contains the chord shape.
- 70 Waveform — sawtooth.
- 80 to 90 Takes each note and Pokes it into the sound registers.
- 110 Pokes chord shape onto screen.
- 130 Clears waveform and sound registers.
- 150 Defines variables. I have put the most used variables first so they will be at the top of the variables table in memory — this speeds up the program by about 20 percent.
- 160 Clears all sound registers.
- 170 Sets volume and attack and decay.
- 190 Sets screen colours — Black on Black.
- 200 Sets character colour — Light grey.
- 220-240 Reads chord shapes and data to Poke into sound registers for each chord.
- 250-270 Instructions.
- 280-320 Prints frets on to screen.
- 1000-1078 Data for chord shapes.
- 1080-1130 Data for sound registers.

SOFTWARE FILE

(continued from previous page)

```
1076 DATA688766,686766,688666
1077 DATA18,224442,224422,224432
1078 DATA335553,335553,335543
1080 DATA5,71,5,152,5,237,6,71,6,167,7,12,7,119,7,233,8,97
1090 DATA7,12,7,119,7,233,8,97,8,225,9,104,9,247,10,143,11,48
1100 DATA9,104,9,247,10,143,11,48,11,218,12,143,13,78,14,24,14,239
1110 DATA12,143,13,78,14,24,14,239,15,210,16,195,17,195,18,209,19,239
1120 DATA15,210,16,195,17,195,18,209,19,239,21,31,22,96,23,181,25,30
1130 DATA21,31,22,96,23,181,25,30,26,156,28,49,29,223,31,165,33,135
```

3D Oxo

A J Heathcote,
Canterbury,
Kent.

ZX-81

3D OXO IS A three-dimensional adaptation of noughts and crosses. This program is written in machine code for a 16K ZX-81.

The board displayed on the screen is a representation of a 4 by 4 cube. The aim of the game is to complete a line of four crosses — in any direction — before the computer gets a line of four noughts. The player may select one of three levels of skill; level 1 is the easiest. The machine code is stored in a Rem statement in Line 1. To create this line, type:

1 Rem, followed by 133 characters.

If the line has been correctly entered, then Peek 16647 = 118. By editing the line number, enter a total of 12 Rem statements — lines 1-12 — of the same length. Check that Peek 18176 = 118, then:

```
POKE 16511, 128
POKE 16512, 6
```

Line 1 is now one long Rem statement containing 1,662 characters. The machine code occupies 1,528 of these addresses; the remaining addresses are used by the computer as a workspace.

Type in the hex loader program — figure 1. Run the program, and enter the machine code, line by line, as shown in figure 2. Save the program on a cassette, then overwrite lines 10-40 as follows:

```
10 RAND USR 17831
20 STOP
30 SAVE "3D OXO"
40 RUN
```

Delete lines 50-250, and then run the program. If the code has been entered correctly, you will be asked first to choose your level of play and then to decide who starts. At the beginning of each move, a cursor appears at the top left-hand corner of the board. The keys 5 to 8 are used to move the cursor. Shift 6 and Shift 7 will move the cursor to a different level — down and up respectively.

Move the cursor to the square of your choice, then press Newline to enter an X. The computer makes its move in the same way, entering a 0 in one of the squares. To stop the game, enter S instead of making your move.

A complete line of noughts or crosses is indicated by a row of flashing squares. If no result is possible, the computer declares a draw.

When you are satisfied that the program is running smoothly, save it again, using the command Run 30.

A copy of this program is available on a cassette, price £3, from A J Heathcote, 11 Norman Road, Canterbury, Kent CT1 3LX.

Figure 1.

```
10 REM HEX LOADER
20 PRINT "START ADDRESS"
30 INPUT A
40 LET A$=""
50 FOR N=A TO 18034 STEP 8
60 SCROLL
70 LET S=0
80 PRINT AT 18,0;N;" ";
90 INPUT A$
100 IF A$="S" THEN STOP
110 IF LEN A$<>16 THEN GOTO 220
120 PRINT A$;" = ";
130 INPUT T
140 PRINT T
150 FOR K=0 TO 7
160 LET C=16*CODE A$+CODE A$(2)
170 LET S=S+C
180 POKE N+K,C
190 LET A$=A$(3 TO )
200 NEXT K
210 IF S=T THEN GOTO 240
220 PRINT AT 18,7;"PLEASE ENTER AGAIN"
230 GOTO 70
240 NEXT N
250 STOP
```

Figure 2.

```
16514 3E343A370032343B = 388
16522 2A00323E0032343B = 315
16530 2A00173E343A003C = 297
16538 2E331717002E003C = 249
16546 2E33001700263334 = 261
16554 392D2A370000002C = 243
16562 26322A0F0000002C = 505
16570 B480B8B9A6B7B9B8 = 1395
16578 0F00103E18321117 = 207
16586 26002937263C1700 = 255
16594 011504130D0D100B = 98
16602 0105110521053105 = 120
16610 0403140324033403 = 124
16618 0111051109110D11 = 96
16626 040F080F0C0F100F = 100
16634 0114021403140414 = 90
16642 0D0C0E0C0F0C100C = 106
16650 0101050109010D01 = 32
16658 0101150119011D01 = 96
16666 2101250129012D01 = 160
16674 3101350139013D01 = 224
16682 0104020403040404 = 26
16690 1104120413041404 = 90
16698 2104220423042404 = 154
```

```
16706 3104320433043404 = 218
16714 0110021003100410 = 74
16722 0510061007100810 = 90
16730 09100A100B100C10 = 106
16738 0D100E100F101010 = 122
16746 FFC5CDF50806093E = 987
16754 16D710FDC1040DC9 = 917
16762 CD7D41CD8041C5CD = 1195
16770 F5083E18D706043E = 626
16778 1BD73E18D710F8C1 = 1000
16786 040DC9FD3622001E = 589
16794 0406000E09D5CD6B = 558
16802 41CD7A41CD6B41D1 = 1043
16810 1D20F0C9CD8B022C = 940
16818 20FACDBB02444D2C = 865
16826 28F6CDBD077EC901 = 1017
16834 00400BCB7828FBC9 = 890
16842 01140BD5CDF508D1 = 912
16850 010900C3680B21C0 = 548
16858 46AF327F46064077 = 681
16866 2310FCC9ED4B3C40 = 940
16874 FD563EC9CDE64179 = 1223
16882 8790C6094F7A8782 = 952
16890 87803C47C3F508CD = 1047
16898 EE41CBFEFE5CDAE41 = 1433
16906 E1CB8EFE76283FFE = 1347
16914 382833E5213E40FE = 789
16922 702007AFBE282135 = 642
16930 1821FE7120083E03 = 529
16938 BE28153418152BFE = 645
16946 2328E8FE2228EF28 = 917
16954 FE2128DFFE2428E6 = 1110
16962 E118BFE118B9CDBB = 1266
16970 022C20FACF08CB6E = 856
16978 20B03634CDE64121 = 847
16986 80467A8787808787 = 986
16994 8116005F193634C9 = 578
17002 118046A7ED527D16 = 848
17010 FF14D61030FBC610 = 1018
17018 06FF04D60430FBC6 = 960
17026 044FC97BA7C834C5 = 1023
17034 E5D5CDEE41CBFECD = 1612
17042 C141CB8ED1E1C17B = 1401
17050 BEC83418EACD6A42 = 1077
17058 CDB84259CD894258 = 1040
17066 23CD85425A23CD85 = 902
17074 422A0E40363D213E = 396
17082 40AF772B772B77C9 = 883
17090 4E235EAF4757217F = 700
17098 46094F06043A2140 = 323
17106 BE2004CBC11816AF = 843
17114 BE2010CB512808CB = 773
```

(continued on page 177)



The famous Panda Expandable RAM pack for the ZX81. Massive 16K add-on memory which can easily be expanded to a GIANT 32K with an optional plug-in MODULE. Rugged no-wobble design injection moulded case with integral LED power on indicator. No additional power supply needed, just plug on and go. British designed and built. Thousands in use. Prices: PANDA 16K £19.95. MODULE £14.50. GIANT 32K £34.00.

Spectravideo QUICK SHOT 2. JOYSTICK

The Most Popular Joystick, 8 position, 2 fire buttons PLUS Rapid-Fire switch. Left or Right handed index finger (Trigger Finger) and top-mounted Thumb operated Fire Button. Comfortable contoured ultra ergonomic Design. Built-in Stabilizing suction caps for impressive one-handed operation. Suitable for most computers with Nine way socket. VIC 20, Commodore 64, Atari, Spectrum (with interface) etc. £12.50 incl.

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PROFESSIONAL CASED KEYBOARD TYPE FD42. Models for the ZX81 and SPECTRUM

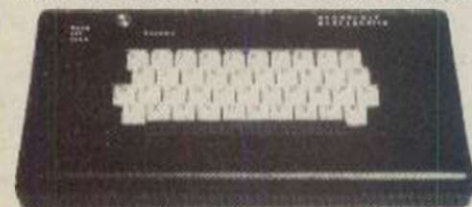
(PLEASE STATE WHICH)

The Fuller FD42 has long been our most popular seller. Its Sturdy, attractive but very tough, injection moulded BAS case houses the computer and converts it into a professional unit with 42 full size long-life computer-style full-travel keys. Keys are indelibly etched with ZX81 or Spectrum legends. No skills or soldering needed and full access is maintained to the user ports etc for add-ons. Power supply can be fitted inside. Has integral LED for power ON/OFF indication. In all a thoroughly worthwhile accessory to your computer. £29.95 plus £2.00 postage and handling.



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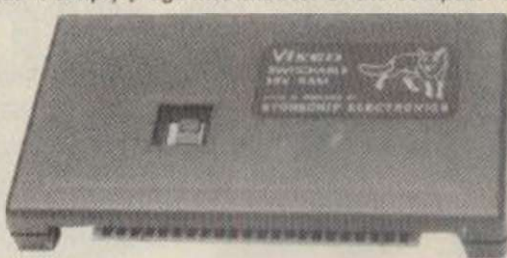
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THE VIXEN SWITCHABLE RAM £34.95

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The Vixen 16K switchable Ram cartridge is unique approach to expanding your VIC 20. Being switchable from either 16K to 8K + 3K programs already in use based on the unexpanded Vic 20 are not obsoleted. Supplied in attractive custom made case it simply plugs into the rear of the computer or motherboard.

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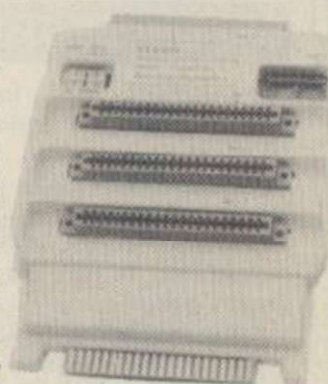


THE VIXEN MOTHERBOARD £31.95

THE EXPANDABLE EXPANSION SYSTEM. Providing 4 additional cartridge slots PLUS ROM socket. The slots are switchable enabling cartridges to be left in place and selected as needed by switching thus avoiding constant handling and the danger of breakage. Having one socket at the rear enables further expansion. Used in conjunction with one or more Vixen Rams full expansion can be achieved. ROM socket enables ROMs and Eproms to be fitted for future software programs, toolkits etc.

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A sound investment for the serious user and serious games player which will not become obsolete.



LIGHT PEN. For the VIC 20. This allows the user to draw and paint in colour on the screen. It is ideal for screen layouts, graphic designs or as a games aid. Screen layouts can be altered and erased as desired and the finished work can be saved on tape and reloaded for future use or editing. Excellent Horizontal and Vertical resolution with superb stability. The Pen works perfectly in the High Resolution Graphics mode, even though the resolution determined by your VIC 20 is only 1/4 Pixel. Supplied complete with software cassette and full instructions. £19.95



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SPECTRUM UPGRADES 16K to 48K

THE KIT — Fit it yourself, a beautifully packed and presented kit with complete (Really complete in the detail you need if you've never seen inside your computer) instructions. No soldering — no wire bending — no fiddly bits. Thousands in use. Everything you need to upgrade your issue 2 Spectrum from 16K to a full blown 48K. The really economical upgrade — in stock for swift despatch. £23.00

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Features: BBC BASIC, 32K, 7 display modes (including 80 column text mode and 640 x 256 graphics resolution), 16 colours, 9 octave sound plus noise channel, built-in Assembler

Complete with an Introductory Cassette containing 16 programs, a User Guide, and a book: "Start Programming on the Electron".

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SOFTWARE FILE

(continued from page 174)

17122	592802CBE1C8D9CB	= 1162	17578	18C30640AF0E0021	= 511
17130	D11802C8C91910DD	= 901	17586	C046BE20010C3003	= 548
17138	C90604AFED52BE28	= 935	17594	7E0E012310F4A728	= 643
17146	0210F8363DC39F42	= 801	17602	2457413A34409030	= 554
17154	CDD84121D2407EFE	= 1173	17610	FD803C4F06407A28	= 755
17162	FF281FE5C0C2423E	= 1082	17618	BE20030D280210F7	= 543
17170	05B92006CDF342E1	= 967	17626	A711C046ED521180	= 910
17178	18233CB9200722C0	= 569	17634	4619C30D4411C940	= 653
17186	46ED53C246E12323	= 949	17642	C3A3430000000000	= 441
17194	16DC3AC146A7C82A	= 974	17650	0000080808000000	= 24
17202	C046ED5BC246CDF3	= 1302	17658	0000080808000000	= 24
17210	42C1C3304621D240	= 879	17666	0000080808000000	= 24
17218	7EFEFFC8E5C0C242	= 1529	17674	0000000000000000	= 0
17226	3E02893005E12323	= 597	17682	0800080000000000	= 24
17234	18EEC1A7ED52E5ED	= 1407	17690	0008000000000000	= 24
17242	52CD6A42CDF141EB	= 1205	17698	0008000000000000	= 24
17250	E1D5CD6A42CDF141	= 1326	17706	0000000000000000	= 8
17258	D1E5A7ED52EBE14E	= 1462	17714	0800080000000000	= 24
17266	060679CBFF180BA7	= 793	17722	0008000000000000	= 16
17274	77ED5277ED5277ED	= 1232	17730	0800000000000000	= 24
17282	5277C5010020CDC4	= 832	17738	0000000002834353E	= 207
17290	41C1CB7E28E97119	= 998	17746	372E2C2D390E0025	= 299
17298	711971197110EB11	= 657	17754	002F002D2A26392D	= 274
17306	94403E34BE28021E	= 588	17762	2834392A1A001D25	= 283
17314	9DC1C0CA4111A640	= 1069	17770	242000012000CD68	= 413
17322	01140DCD4111AF	= 701	17778	06C90620D710FDC9	= 935
17330	4001140ECD411CD	= 779	17786	FD362200010000CD	= 547
17338	AE41FE33CA4842FE	= 1138	17794	F50806180E20AFD7	= 719
17346	3E20F4C3A445CDD8	= 1167	17802	0D20FC3E76D710F4	= 952
17354	4121D2407EFEFFC8	= 1207	17810	C9BCADA6B980B1AA	= 1358
17362	E5C0C2423E0DB920	= 986	17818	BBAA810F00101D16	= 516
17370	290604A7ED52E57E	= 892	17826	1F11CD7A45010000	= 445
17378	A7201CD5117F46D5	= 867	17834	CD5083E09CD7445	= 919
17386	ED52EB7EA721C046	= 1142	17842	3E17CD74453E76D7	= 870
17394	2809577EBB281023	= 540	17850	D711ED44016000CD	= 839
17402	1520F873E134D1E1	= 1127	17858	6B0B110D45CD6D45	= 600
17410	10D9E1232318C5D1	= 958	17866	11ED44CD6D453E76	= 885
17418	D1E1D1363DCD9F42	= 1188	17874	D7D73E17CD74453E	= 967
17426	E1C33046CDD8433A	= 1068	17882	09CD74453E76D7D7	= 1009
17434	7F46A7C821D2407E	= 997	17890	114D45CD6D450101	= 548
17442	FEFFC8E5C0C2423E	= 1465	17898	12C5CDF508011100	= 691
17450	1DB9202906040E02	= 313	17906	119345CD6B0BCDAE	= 935
17458	A7ED52E57EA7201A	= 1066	17914	41FE1D38F9FE2030	= 987
17466	D5117F46ED52E56E	= 1067	17922	F5327C40C1CDF508	= 1134
17474	21C0467EBB20060D	= 659	17930	011100118840CD6B	= 595
17482	2810327B40231520	= 381	17938	0BCDAE41FE322805	= 804
17490	F2D1E110DBE12323	= 1206	17946	FE3E20F5AFF5CD7A	= 1340
17498	18C5D1E1E1217B40	= 1100	17954	45218046CDD841CD	= 994
17506	5E2D2600C3E044CD	= 885	17962	9541F1A7280CCDB8	= 1063
17514	D84121D2407EFEFF	= 1223	17970	42118240CDDA41CD	= 954
17522	2838E5C0C2423E03	= 855	17978	0142118B40CDDA41	= 759
17530	A1FE032828A72802	= 707	17986	FD36213DCD3F43CD	= 941
17538	3E013C00CB612002	= 457	17994	02433A7C40FE1D28	= 638
17546	C6044F0604AFED52	= 785	18002	1FCDC843FD362134	= 895
17554	BE2010E5D5118046	= 895	18010	CDC8433A7C40FE1E	= 1002
17562	ED5211C046197E81	= 878	18018	280EFD36213DCD15	= 682
17570	77D1E110E8E12323	= 1096	18026	44FD362134CD1644	= 755
			18034	FD36213DCD6944C9	= 980

Race Chase

Martin Blackburn,
Brighouse,
West Yorkshire.

BBC

RACE CHASE makes full use of the BBC's colour and sound facilities. It is by no means easy, and needs skill and quick reactions.

The game starts by displaying a title screen

complete with instructions. After a key is pressed the nine high scores are displayed. The introduction tune, taken from the television series Grand Prix, is played. Next, upon pressing another key the maze is drawn. It then changes colour, and when a colour scheme that you want appears, press a key to retain it.

Both cars will appear; the car that you control is the one on the left. A further key is now pressed, upon which the high score

appears in the middle of the maze, complete with the person's name.

Your score and bonus appear at the top of the screen and the game starts. When a dot has been run over the computer emits a short note, and the score increases by 10 points. Your car can be moved in or out one lane only by pressing key I or D respectively at the appropriate moment.

The object of the game is to clear the maze
(continued on page 179)

```

140 *FX14,6
150A1$=CHR$(129):A2$=CHR$(130):A3$=CHR$(131):A4$=CHR
$(132):A5$=CHR$(133):A6$=CHR$(134)
160*KEY 10 D:MINL:IM
170DATA121,20,121,5,129,5,133,10,129,5,121,5,113,5,1
21,5,129,10,101,20
180DIMA$(4),P(4),Q(4),R(4),S(4)
190SC=0:T=5000
200MODE7:FORA=1TO2:PRINTA4$:CHR$(157):CHR$(141):A1$
RACE-CHASE":NEXT
210FORA=23TO24:PRINTTAB(0,A):A4$:CHR$(157):A1$:CHR$(
141):"COPYRIGHT M.Blackburn MARCH 1984":NEXT
220PRINTTAB(0,5):A2$:"The object of the game is to d
rive "A2$:"around the maze, collecting the dots
"A2$:"& avoiding the drongo driver in the "A2$:"
other car"
230PRINTA6$:"There are 2 phases in the game, the
"A6$:"second of which is twice as fast as the"A6$:"f
irst."
240PRINT:A5$:"Press 'I' to move in a lane, & 'D' to
"A5$:"move out a lane"
250*FX21,0
260PRINT:PRINT:FORA=1TO2:PRINT:A2$:CHR$(141):"HIT A
KEY":NEXT
270A=GET
280CLS
290DIMS$(10),Z(10)
300FORB=1TO9:S$(B)="Barnaby soft":Z(B)=(300*(10-B)):
NEXT
310FORA=1TO2:PRINT:A4$:CHR$(157):CHR$(141):A1$:

```

(listing continued on page 179)

NEW

For home or business the IBM compatible Advance 86^a

16 Bit Micro-Computer

Under £350*



For the home user start with Model A with its massive 144K RAM, 64K ROM and outstanding typewriter style keyboard that fits within the base unit for portability and storage.

Note the large return key and position of the numeric keyboard. Fast retrieval from storage and fast action on games is achieved by the use of the Intel 8086 16 bit micro-processor running at 4.77 MHz.

The Advance 86A runs IBM PC software.

Specification

CPU Type	16-bit 8086 running at 4.77 MHz.
RAM	128K or 256K with parity plus 16K video
ROM	64K.
ROM Contents	Diagnostics, Basic, Cassette O/S
Languages Included	Basic
Type of Keyboard	Full 84 keys tactile
Keyboard Facilities	10 programmable keys
Character Set	256 in ROM
Method of Display	TV, RGB, Comp/Sync colour or monochrome monitor
Display Facilities	Full screen handling, 4 screen paged
Text	80 x 25 or 40 x 25
Graphics Resolution	320 x 200 or 640 x 200
Colours Available	16
Graphics Facilities	Scroll, reverse image
Cassette Recorder	Audio
Interfaces Included	Cassette port, light pen, joystick, Centronics
Sound	Built-in speaker
Operating System	Built-in ROM
Printers	Any using Centronics parallel interface
Comments	Hardware and software compatible with IBM PC User-upgradeable to Model B Provision for 8087 Arithmetic Processor



The business user can upgrade to Model B by adding the Advance Expansion box containing 2 x 5.25" disc drives providing 720K storage at £956.52.

The Advance 86 Model B offers the business micro-computer buyer an IBM compatible disk-based system with twin drives, with Perfect writer, Speller, Calc, Filer software (MS/DOS) for only £1304.34 plus VAT & Delivery.

Advance 86 Models A & B are designed and marketed by Advance Technology UK Ltd.

128K expansion £125 + VAT

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☐ 128K expansion £125 + VAT

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Name _____ Company _____

Address _____ Address _____

SOFTWARE FILE

(continued from page 177)

of all the dots in the fastest possible time, and at the same time avoiding the Drongo Driver in the other car. The longer you take the lower your score will be as the bonus is constantly decreasing.

If the first maze is completed successfully the screen will be cleared, and the maze will be drawn again. A key will then have to be pressed quickly if the same colour scheme is required. Upon pressing another key the second phase will start, but watch out, it is

twice as fast as the first.

When the first maze has been completed your score will consist of the points scored for running over the dots, plus the remainder of your bonus. On starting the second phase the bonus is reset to 5,000 points.

If a sheet is not completed then no bonus is added to your score. When you are killed, if you achieve a high score then you will be asked for your name — characters only. If your score was not high enough then you will be informed; either way hitting a key restarts

the game.

The Escape key has been disabled so that the high scores cannot be lost if this key is pressed. The only way to stop the game is by pressing the Break key.

Finally, if you have not got the time to copy in the program, or you are not very good at typing, then send a blank cassette along with a stamped addressed envelope, and £1.50 to the following address: Martin Blackburn, 15 Long Ridge, Rastrick, Brighouse, West Yorkshire HD6 3RZ.

(listing continued from page 177)

```
RACE-CHASE HI-SCORES: NEXT
320FORB=1T09:PRINT " ";A3$;B$;" ";A1$;S$(B);STRING$
((25-LENS$(B)), ". ");A5$;Z(B):NEXTB
330*FX21,0
340RESTORE:PRINT:FORA=1T02:PRINT;A4$+CHR$(157);CHR$(
141);A1$;" HIT A KEY":NEXT:FORA=1T010:READC
,D: SOUND1, -15, C-48, D-1: SOUND1, 0, 0, 0: NEXT: A=GET
350ENVELOPE1, 1, 0, 0, 0, 0, 0, 126, -1, -1, -100, 126, 125
360 MODE1
370S=2
380VDU24, 0, 0, 1240, 983;
390GCOLOR, 129: GCOL0, 3: CLG
400COLOR129
410 VDU23, 255, 0, 0, 0, 0, 48, 48, 0, 0
420VDU23, 251, 14, 238, 69, 255, 255, 69, 238, 14
430VDU23, 252, 90, 126, 90, 24, 219, 255, 219, 60
440VDU23, 253, 112, 119, 162, 255, 255, 162, 119, 112
450VDU23, 254, 60, 219, 255, 219, 24, 90, 126, 90
460 FORA=12T0440STEP64
470 MOVEA, A-4
480 DRAWA, 983-A
490 DRAW1243-A, 983-A
500 DRAW1243-A, A-4
510 DRAWA, A-4
520 NEXTA
530COLOR2
540 FORA=1T037STEP2
550 FORB=2T031STEP2
560 PRINTTAB(A, B); CHR$(255);
570 NEXTB, A
580 FORA=2T012
590 PRINTTAB(18, A); " "
600 PRINTTAB(18, A+18); " "
610 NEXT
620 FORA=15T017
630 PRINTTAB(1, A); " "
640 PRINTTAB(27, A); " "
650 NEXT
660FORA=14T018:PRINTTAB(13, A); " "
670PRINTTAB(15, 16)"HIT A KEY"
680*FX21,0
690D=INKEY(100):IFD>0THEN760
700A=RND(5)-1:B=RND(8)-1:C=RND(8)-1
710IFA=B OR A=C THEN700
720VDU19, 1, A, 0, 0, 0
730VDU19, 3, B, 0, 0, 0
740VDU19, 2, C, 0, 0, 0
750GOTO690
760DATA-16, -16, 0, -12, 0, 12, 16, 16, 16, 48, 0, -12, 0, 12, -16
, -48
770RESTORE760:FORA=1T04
780READP(A), R(A), Q(A), S(A):A$(A)=CHR$(250+A):NEXT
790X=540:Y=56:E=1:L=1:D=0:G=668:H=120:M=2:F=3:Z=0
800VDU5
810VDU18, 3, 2, 25, 4, G-P(F)*S;H-Q(F)*S;250+F
820VDU18, 3, 2, 25, 4, X-P(E)*S;Y-Q(E)*S;250+E
830VDU4
840A=GET
```

```
850PRINTTAB(0, 0); " SCORE BONUS
"
860PRINTTAB(13, 15); "HI SCORE ";Z(1):PRINTTAB(15, 16);
" BY ";TAB(13, 17);S$(1);STRING$(13-LENS$(1), ". ");
VDU5
870*FX11,9
880*FX12,2
890VDU18, 3, 2, 25, 4, X-P(E)*S;Y-Q(E)*S;250+E:B=INKEY(1)
: *FX21,0
900IFPOINT(X+R(E), Y+S(E))=3THENE=E+1:IFE=5THENE=1
910IFPOINT(X+16, Y-16)=2THEND=D+1:SC=SC+10:SOUND1, -15
, (D MOD 2)*4, 1
920IFD=240THEN1100
930VDU4:PRINTTAB(8, 0);SC;TAB(32, 0);T:VDU5
940IFB<>73THEN960ELSEIFX>584ANDX<624ANDL<6THENY=Y-P(
E)*4:L=L+1
950IFY>472ANDY<512ANDL<6THENX=X+Q(E)*4:L=L+1
960IFB<>79THEN980ELSEIFY>472ANDY<512ANDL>1THENX=X-Q(
E)*4:L=L-1
970IFX>584ANDX<624ANDL>1THENY=Y+P(E)*4:L=L-1
980VDU18, 0, 3, 25, 4, X;Y;250+E
990X=X+P(E)*S;Y=Y+Q(E)*S
1000VDU18, 3, 2, 25, 4, G-P(F)*S;H-Q(F)*S;250+F
1010 IFPOINT(G+R(F), H+S(F))=3THENF=F-1:IFF=0THENF=4
1020IFL<=M THEN1040ELSEIFG>584ANDG<624THENH=H+P(F)*4:
M=M+1
1030IFH>464ANDH<520THENG=G-Q(F)*4:M=M+1
1040IFL>=M THEN1060ELSEIFH>464ANDH<520THENG=G+Q(F)*4:
M=M-1
1050IFG>584ANDG<624THENH=H-P(F)*4:M=M-1
1060VDU18, 3, 2, 25, 4, G;H;250+F
1070IFABS(G-X)<40ANDABS(H-Y)<40THEN1220
1080G=G+P(F)*S;H=H+Q(F)*S:T=T-(3*S)
1090GOTO890
1100VDU4:S=S*2:D=0
1110IFS=8THEN1120ELSESC=SC+T:T=5000:GOTO380
1120SC=SC+T
1130MODE7
1140*FX12,0
1150IFSC<=Z(9)THEN1270
1160B=9:*FX21,0
1170IFSC>Z(B)THENZ(B+1)=Z(B):S$(B+1)=S$(B)
1180IFSC<=Z(B-1)ORB=1THENZ(B)=SC:PRINT;A6$;"Well done
.....you're in the top 9":PRINT;A2$;"Please enter you
r name":INPUT " ";S$(B)ELSE1200
1190IFLENS$(B)>12THENSOUND1, -15, 100, 5:CLS:GOTO1180ELS
EGOTO1210
1200B=B-1:IFB>0THEN1170
1210PRINT;A4$;"Press any key to play again":B=GET:RES
TORE760:SC=0:T=5000:CLS:GOTO310
1220*FX12,0
1230*FX21,0
1240MODE7
1250SOUND0, 1, 6, 100:MODE7
1260GOTO1150
1270FORA=1T02:PRINTCHR$(141);A6$;"NO HI-SCORE!":NEXT
1280*FX21,0
1290GOTO1210
```

Listing 2. Casino hex dump.

```
7530: 8E, D, 89, 10, 8E, 1E, 4C, EC, A1, ED,
753A: 84, 30, 88, 20, 10, 8C, 1E, BE, 25, F3,
7544: 8E, D, 8C, 10, 8E, 21, 6C, EC, A1, ED,
754E: 84, 30, 88, 20, 10, 8C, 21, DE, 25, F3,
7558: 8E, D, 8F, 10, 8E, 24, 8C, EC, A1, ED,
7562: 84, 30, 88, 20, 10, 8C, 24, FE, 25, F3,
756C: 8E, D, 92, 10, 8E, 27, AC, EC, A1, ED,
7576: 84, 30, 88, 20, 10, 8C, 28, 1E, 25, F3,
7580: 39, FC, 7D, 66, 10, 83, 0, 0, 27, 23,
758A: BE, 1F, 2E, BF, 7D, 64, 8E, 1F, 2E, EC,
7594: 84, ED, 2, 30, 1E, 8C, 1D, FE, 26, F5,
759E: BE, 7D, 64, BF, 1E, 0, FC, 7D, 66, 83,
75A8: 0, 1, FD, 7D, 66, FC, 7D, 68, 10, 83,
```

```
75B2: 0, 0, 27, 23, BE, 22, 4E, BF, 7D, 64,
75BC: 8E, 22, 4E, EC, 84, ED, 2, 30, 1E, 8C,
75C6: 21, 1E, 26, F5, BE, 7D, 64, BF, 21, 20,
75D0: FC, 7D, 68, 83, 0, 1, FD, 7D, 68, FC,
75DA: 7D, 6A, 10, 83, 0, 0, 27, 23, BE, 25,
75E4: 8E, BF, 7D, 64, 8E, 25, 6E, EC, 84, ED,
75EE: 2, 30, 1E, 8C, 24, 3E, 26, F5, BE, 7D,
75F8: 64, BF, 24, 40, FC, 7D, 6A, 83, 0, 1,
7602: FD, 7D, 6A, FC, 7D, 6C, 10, 83, 0, 0,
760C: 10, 27, 45, 16, BE, 28, 8E, BF, 7D, 64,
7616: 8E, 28, 8E, EC, 84, ED, 2, 30, 1E, 8C,
7620: 27, 5E, 26, F5, BE, 7D, 64, BF, 27, 60,
762A: FC, 7D, 6C, 83, 0, 1, FD, 7D, 6C, BD,
7634: 75, 30, 7E, 75, 81, 0, 0, 0, 0, 0,
763E: 0, 0, A7, A0, 5C, C1, 10, 26, F3, FC,
```

Casino

Smog,
Radcliffe-on-Trent,
Nottingham.

DRAGON

THIS IS A game that I devised while playing around with my assembler. I didn't realise how easy writing such a game was. The only thing involved is moving different memory locations around and testing others.

The hardest part was defining the graphics

(continued on next page)

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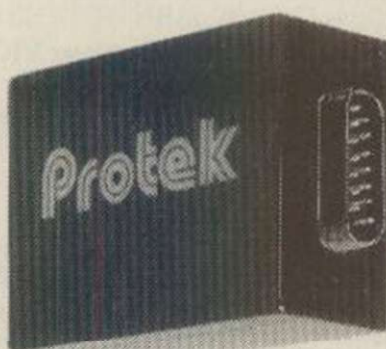


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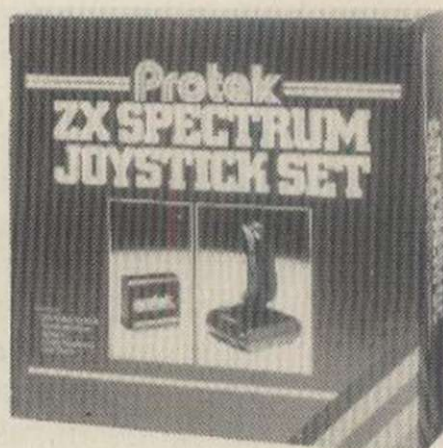


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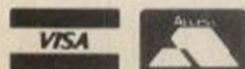
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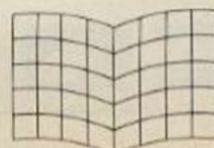
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SOFTWARE FILE

(continued from page 183)

```

2160 IF SCRN(X%+1,Y%)=64 THEN MNZ=MNZ+1
2170 IF SCRN(X%,Y%+1)=64 THEN MNZ=MNZ+1
2180 IF SCRN(X%,Y%-1)=64 THEN MNZ=MNZ+1
2190 PLOT 7,0,STR$(MNZ)
2200 MNZ=0:PLOT 32,0,STR$(SCZ)
2210 UNTIL DIE% OR Y%=2
2220 IF DIE% THEN 2270
2230 PING:CLS
2240 MINE%=MINE%+5:IF MINE%>25 THEN FLAG%=FLAG%+INT(R
ND(1)*5)
2260 GOTO 2000
2270 DIE%=FALSE:GOSUB 7000
2280 LIVE%=LIVE%-1
2290 IF LIVE%=0 THEN GOSUB 8000:RETURN
2310 GOTO 2000
3000 REM Set up the screen
3010 PAPER4:CLS
3020 PLOT 0,2,"#####
"
3030 PLOT 0,25,"#####
"
3040 FOR X=3 TO 25:PLOT 0,X,"#":PLOT 37,X,"#":NEXTX
3050 IF NOT CHEAT% THEN GOSUB 4000
3060 FOR X=1 TO MINE%
3070 Y=INT(RND(1)*36)+1
3080 Z=INT(RND(1)*21)+3
3090 PLOT Y,Z,"e"
3100 NEXTX
3110 PLOT 0,0,CHR$(2)+"Mines:"
3120 PLOT 13,0,CHR$(3)+"Lives:"+RIGHT$(STR$(LIVE%),1)
3130 PLOT 25,0,CHR$(5)+"Score:"
3140 PLOT 18,2," "
3150 PLOT 18,25," "
3160 X%=19:Y%=25
3170 PLAY0,0,0,0
3180 IF FLAG%=FALSE THEN RETURN
3190 FOR X=1 TO FLAG%
3200 Y=INT(RND(1)*35)+1
3210 Z=INT(RND(1)*20)+4
3220 PLOT Y,Z,"_"
3230 NEXTX
3240 RETURN
4000 REM Redefine Mine
4010 FOR X=#B600 TO #B607
4020 POKE X,0
4030 NEXTX

```

```

4040 RETURN
5000 REM Redefine Mine
5010 POKE#B600,30
5020 POKE#B601,45
5030 POKE#B602,30
5040 POKE#B603,18
5050 POKE#B604,30
5060 POKE#B605,33
5070 POKE#B606,30
5080 POKE#B607,33
5090 RETURN
7000 REM Action Replay!
7010 GOSUB 5000 'Redefine Mine
7020 PLOT X%,Y%,"@"
7030 WAIT 75
7040 PLOT 0,0,CHR$(17)+CHR$(12)+"ACTION REPLAY -- PLEA
SE WATCH"+CHR$(8)+CHR$(0)
7050 FOR X=1 TO CNT%-1:CALL#FB03
7060 PLOT M2%(X),M1%(X),"*"
7070 WAIT 15
7080 PLOT M2%(X),M1%(X)," "
7090 NEXTX:PLOT M2%(CNT%-1),M1%(CNT%-1),"X"
7100 ZAP
7110 WAIT 300
7120 RETURN
8000 REM Lost all lives
8010 FOR X=12 TO 1 STEP -1
8020 MUSIC 1,5,X,7:PLAY 1,0,7,100
8030 WAIT 20:NEXTX:PLAY0,0,0,0
8040 WAIT 500
8050 RETURN
9000 REM Define characters
9010 FOR X=#B6F8 TO #B6FF
9020 READ Y:POKE X,Y
9030 NEXTX
9040 DATA 15,28,30,28,16,16,16,56
9050 FOR X=#B550 TO #B557
9060 READ Y:POKE X,Y
9070 NEXTX
9080 DATA 12,18,12,63,63,51,18,18
9090 FOR X=#B518 TO #B51F
9100 READ Y:POKE X,Y
9110 NEXTX
9120 DATA 63,33,33,33,33,33,33,63
9130 RETURN
10000 REM THIS PROGRAM WAS WRITTEN BY
10010 REM Anthony Timson <c>1984 A.T.

```

Saturn Patrol

Patrick Edmond,
Drifffield,
East Yorkshire.

CBM-64

SATURN PATROL is a high-speed, arcade-style game for the Commodore 64. Use a joystick to control your ship at the top of the screen and fire down at the many swarming aliens, but watch out for the missiles aimed at your ship, even if you are moving they are fired on the correct trajectory — your skill is required to avoid them. There is no time limit to the game — just dodge the missiles as long as you can.

Saturn Patrol can be keyed in as shown but if you own an assembler or machine-code monitor and do not like waiting for the hex code to be entered from data statements into memory by the Basic routine — which takes about 45 seconds — then save the machine code separately.

Type in the program omitting lines 30, 1000 to 1460, 3000 to 3070 and add the following line

```
1 A=A+1:IF A=1 THEN LOAD " ",
1,1 and save on cassette
```

Now enter the hex code in lines 1000 to 1460 directly with your assembler starting at location \$6000 (24576 decimal) and save this on cassette after the previous Basic program (Save \$6000 to \$62E0).

To load these programs press shift and run stop, the machine code will be loaded by line

1 of the Basic program.

Saturn Patrol uses three sprites — data stored from 16128 to 16384 — one for your ship, one for your bomb and one for the missile. User defined graphics start at 12288, Sys 25280 is a routine copying some of the Commodore 64 ROM characters into RAM for the words High Score and the numbers zero to nine.

The aliens make up characters 65 to 74, 65 being just the feet and consecutive characters

are more of the alien up to 74 which is the whole alien.

One routine puts alien feet on the screen at random, another scans the screen and increments any character between 65 and 73 — hence the aliens build up from feet to whole body.

To change the colour of the aliens change line 352, the colour code is Poked into location 253 and the subroutine at 25184 fills colour RAM with this colour.

```

10 POKE52,48:POKE56,48:CLR
20 POKE46,44:POKE48,44:POKE50,44:CLR
30 GOSUB3000:REM ENTER MACHINE CODE
40 SYS25280:REM COPY ROM CHARSET
80 GOSUB2000:REM SET UP U.D. GRAPHICS
90 SP$="#####
"
100 POKE53281,10:POKE53280,10:PRINT"J":POKE53272,21:POKE53269,0
110 PRINTSPC(14)"■SATURN PATROL"
120 PRINT"#####DURING ROUTINE PATROL OVER THE SURFACE"
130 PRINT"OF SATURN YOU DISCOVER ALIENS GATHERING,"
140 PRINT"FOR AN INVASION ? ..... THESE ALIENS ARE"
150 PRINT"CERTAINLY HOSTILE , AT LEAST, SINCE THEY"
160 PRINT"IMMEDIATELY AIM & FIRE MISSILES AT YOUR"
170 PRINT"ATMOS-CRAFT .... YOU DECIDE TO RADIO FOR"
180 PRINT"ASSISTANCE ,& IN THE MEANTIME ATTEMPT TO"
190 PRINT"CONTROL THESE SWARMING ALIENS."
200 PRINTSPC(7)"PRESS ANY KEY TO CONTINUE":POKE198,0
210 GETA$:IFA$=""THEN210
220 PRINT"J":POKE53280,0:POKE53281,0
230 PRINT"USE A JOYSTICK (IN CONTROL PORT 2)"
240 PRINT"TO CONTROL YOUR ATMOS-CRAFT."
250 PRINT"BEWARE OF THE MISSILES LAUNCHED AT HIGH"
260 PRINT"SPEED....BONUS POINTS ARE AWARDED FOR "
270 PRINT"HITTING THEM IN MID-FLIGHT BUT SINCE "
280 PRINT"THEY ARE INDESTRUCTABLE YOU MUST SOON"
290 PRINT"DODGE OUT OF THE WAY."
300 PRINTSPC(11)"PRESS A KEY TO START":POKE198,0

```


SOFTWARE FILE

```

340 GETAF:R2=RND(TI) IF AF="" THEN 340
349 FORI=0 TO 16:POKE53248+I,0:NEXT
350 REM M/C ROUTINE TO COLOUR SCREEN
351 REM 251 STORES THE COLOUR CODE
352 PRINT "J":POKE253,6:SYS25184
353 FORI=0 TO 39:POKE1984+I,34
354 POKE1904+I,33:POKE56256+I,8
355 POKE56176+I,8:NEXT
356 REM SET SOUND + SPRITES
357 PRINTSP#;"HIGH SCORE",HI
358 FORI=0 TO 32:POKE32512+I,20:NEXT
359 POKE32565,0:POKE32566,0
360 POKE3288,1:POKE3289,1
361 FORI=0 TO 32:POKE32512+I,20:NEXT
362 POKE255,54:POKE254,0:POKE2040,255
363 POKE53248,54:POKE53249,50
364 POKE2041,254:POKE53264,0
365 POKE53269,1:POKE53287,7:POKE53276,1
366 POKE53285,8:POKE53286,10
367 POKE54272,5:POKE54277,63
368 POKE54278,9:POKE54276,0
369 POKE54296,15:POKE2042,253
370 POKE54274,0:POKE54275,1
371 POKE54286,200:POKE54287,0
372 POKE54291,10:POKE54292,10
373 POKE54290,0
374 POKE54274,0:POKE54275,1
375 POKE54281,10:POKE54280,10
376 POKE54284,15:POKE54285,7
377 POKE53272,28:POKE53278,0
378 POKE53271,0:POKE53277,0
379 PRINTSP#;"TAB(24)*SCORE 000000"
400 SYS25238:REM MAIN GAME ROUTINE
401 R=PEEK(53248):R=R-10
402 IFR>0 THEN 404
403 R=R+255:POKE53264,PEEK(53264)AND254
404 POKE53248,R
700 POKE2040,252:POKE53277,1
701 POKE53271,1:POKE54276,0
702 POKE54283,0:POKE54286,5
703 POKE54287,20:POKE54290,0
704 POKE54291,15:POKE54292,14
705 POKE54290,129:SC=0
706 FORJ=0 TO 50:POKE53249,50+(J*J/12,5)
707 POKE54287,3*J:POKE53287,2+J
708 IFJ=4 THEN POKE54290,128
709 POKE53286,J:POKE53285,1+J:NEXTJ
710 FORI=0 TO 5
711 SC=SC+(PEEK(1980-I)-48)*1011
712 NEXT PRINT "YOU SCORED ";SC
713 POKE53269,0:IFSC>HITHEHI=SC
714 PRINT "HIGH SCORE "HI:POKE198,0
715 PRINT "PRESS ANY KEY"
716 GETAF:IF AF="" THEN 716
717 GOT0100
900 DATA195,124,124,254,214,124,56,0
910 DATA32,32,0,60,240,0,51,48,0,51
920 DATA48,0,63,240,0,15,192,0,3,0,0
930 DATA1,0,0,-1
1000 DATAAD,00,DC,29,04,C9,04,F0
1005 DATA28,A5,FE,C9,00,D0,11,A5
1010 DATAFF,C9,1A,F0,1C,38,E9,02
1015 DATA05,FF,8D,00,D0,4C,31,60
1020 DATAA5,FF,38,E9,02,85,FF,8D
1025 DATA00,D0,80,05,C6,FE,CE,10
1030 IATA00,AD,00,DC,29,00,C9,00
1035 DATAF0,28,A5,FE,C9,00,F0,11
1040 DATAA5,FF,C9,40,F0,1C,18,69
1045 DATA02,85,FF,8D,00,D0,4C,62
1050 IATA00,A5,FF,18,69,02,85,FF
1055 IATA00,00,D0,90,05,EE,10,D0
1060 IATA06,FE,20,97,E0,A5,63,4A
1065 IATA4A,4A,AA,DE,00,7F,8D,00
1070 IATA7F,C9,00,D0,05,A9,13,9D
1075 IATA00,7F,A0,00,8C,31,7F,0A
1080 IATA0A,0A,8D,30,7F,0A,2E,31
1085 IATA7F,0A,2E,31,7F,18,6D,30
1090 IATA7F,8D,30,7F,90,03,EE,31
1095 IATA7F,A9,54,85,AA,A9,04,85
1100 IATAAB,AD,30,7F,18,65,AA,85
1105 IATAAA,90,02,E6,AB,18,AD,31
1110 IATA7F,65,AB,85,AB,8A,AA,A9
1115 IATA41,91,AA,8E,27,D0,8A,18
1120 IATA69,0A,8D,01,D4,29,01,18
1125 IATA69,12,8D,04,D4,EA,EA,EA
1130 IATAAD,03,D0,C9,00,D0,2E,A5
1135 IATA63,18,C9,F0,90,42,20,87
1140 IATA62,8D,02,D0,AD,10,D0,29
1145 IATA05,8D,10,D0,29,01,0A,0D
1150 IATA10,D0,8D,10,D0,A9,C8,8D
1155 IATA03,D0,AD,15,D0,09,02,8D
1160 IATA15,D0,4C,20,61,AD,03,D0
1165 IATA38,E9,08,8D,03,D0,18,C9
1170 IATA22,80,0D,A9,00,8D,03,D0
1175 DATARD,15,D0,29,05,8D,15,D0
1180 DATARD,03,D0,38,E9,60,8D,08
1185 DATAD4,29,01,69,20,8D,0E,D4
1190 DATAR9,00,85,FB,AD,05,D0,C9
1195 DATA00,D0,44,AD,00,DC,29,10
1200 DATAC9,10,F0,38,AD,00,D0,8D
1205 DATA04,D0,4A,4A,4A,85,FC,AD
1210 DATA00,AD,10,D0,29,03,8D,10
1215 IATA00,29,01,0A,0A,0D,10,D0
1220 IATA0D,10,D0,20,76,62,18,65
1225 IATAFC,18,69,26,85,FC,A9,04
1230 DATA85,FD,A9,30,8D,05,D0,B1
1235 DATAFC,8D,37,7F,4C,F6,61,A0
1240 DATA00,AD,37,7F,91,FC,A5,FC
1245 DATA18,69,28,85,FC,90,02,E6
1250 DATAFD,AD,05,D0,18,69,08,8D
1255 DATA05,D0,AD,15,D0,09,04,8D
1260 DATA15,D0,AD,05,D0,18,C9,D8
1265 DATA90,16,AD,15,D0,29,03,8D
1270 DATA15,D0,A9,00,8D,05,D0,8D
1275 DATA0F,D4,8D,12,D4,4C,F6,61
1280 DATA00,00,B1,FC,8D,37,7F,18
1285 DATAC9,40,90,0A,18,C9,4E,80
1290 DATA05,38,E9,40,05,FB,A9,20
1295 DATA8D,37,7F,A9,01,8D,12,D4
1300 DATARD,05,D0,8D,0F,D4,AD,1E
1305 DATAD0,29,06,C9,06,D0,07,A9
1310 DATA64,18,65,FB,85,FB,EA,EA
1315 DATREA,EA,EA,EA,EA,EA,EA,EA
1320 DATAR9,04,85,AB,A9,00,85,AA
1325 DATAR0,00,B1,AA,18,C9,40,90
1330 DATA0A,18,C9,49,E0,05,18,69
1335 DATA01,91,AA,C8,10,EC,E6,AB
1340 DATAA5,AB,C9,00,10,E2,A5,A9
1345 DATREA,EA,C9,01,10,14,AD,02
1350 DATAD0,38,E9,02,8D,02,D0,80
1355 DATA08,AD,10,D0,29,05,8D,10
1360 DATAD0,60,AD,02,10,18,65,A9
1365 DATA8D,02,D0,90,08,AD,10,D0
1370 DATA09,02,8D,10,D0,60,EA,EA
1375 DATREA,EA,EA,EA,EA,EA,EA,EA
1380 DATAR2,00,A5,FD,5D,00,D8,9D
1385 DATAR0,D9,9D,00,IA,9D,00,DB
1390 DATAR8,D0,F1,60,EA,EA,00,20
1395 DATARD,10,D0,29,01,C9,01,F0
1400 DATA02,AD,00,90,A0,00,60,AD
1405 DATA00,DC,4A,4A,49,03,29,03
1410 DATA85,A9,AD,00,D0,60,A5,FB
1415 DATAC9,00,F0,17,A2,06,C6,FB
1420 DATAFE,B6,07,8D,36,07,C9,3A
1425 DATAD0,EC,A9,30,9D,86,07,CA
1430 DATA4C,A0,62,20,00,60,AD,1E
1435 DATAD0,29,01,C9,01,D0,D7,60
1440 DATAR8,A5,01,29,FB,85,01,A2
1445 DATA00,8D,00,D0,9D,00,30,8D
1450 DATA00,D1,9D,00,31,E8,D0,F1
1455 DATAR5,01,09,04,85,01,58,60
1460 DATA*
2000 FORI=0 TO 7:POKE12544+I,0
2001 POKE12992+I,24:NEXT
2002 FORI=0 TO 63:POKE12808+I,0:NEXT
2003 FORI=0 TO 7:READA:FORJ=0 TO 7-I
2004 POKE12879-J*8-I,8:NEXTJ,I
2005 FORI=16128 TO 16383:POKEI,0:NEXT
2006 FORI=0 TO 23:READA:POKE16320+I,A
2007 NEXT:FORI=24 TO 63:POKE16320+I,0
2008 NEXT
2009 FORI=0 TO 7:POKE16216+I*3,3
2010 POKE16280+I*3,3:NEXT
2011 FORI=1 TO 14:POKE12552+I,0:NEXT
2012 POKE12552,255:POKE12567,255
2013 FORI=16128 TO 16191:POKEI,RND(1)*255
2014 NEXT:RETURN
3000 READA:IFAC=1 THEN 3000
3010 J=24576:PRINT "ENTERING DATA"
3020 READA:IF AF="" THEN RESTORE:RETURN
3030 R=RIGHT$(AF,1)
3040 L=LEFT$(AF,1):L=ASC(L)-48
3050 R=ASC(R)-48:IFR>9 THEN R=R-7
3060 IFL>9 THEN L=L-7
3070 POKEJ,L*16+R:J=J+1:GOTO3020

```

```

1 REM KEYWORDS G.KENDALL ,1939
5 IF PEEK 23631+256*PEEK 2363
2<>23734 THEN PRINT "STOP HERE."
: STOP
10 CLEAR 30999
20 LET ADD=31000: REM address
30 LET H=0: REM hex to dec
40 LET NUM=1010: REM line no.
50 LET ERR=0: REM error count
60 PRINT "PLEASE WAIT..."
100 RESTORE: READ A$,A
110 FOR F=1 TO 301
120 FOR Z=1 TO 2
140 LET H=H*16+CODE A$(Z)-48-7*
(A$(Z)>"9")
150 NEXT Z
160 LET ERR=ERR+H
170 POKE ADD,H: LET ADD=ADD+1:
LET H=0
180 LET A$=A$(3 TO )
190 IF NOT LEN A$ THEN GO SUB 5
00
200 NEXT F
210 PRINT NUM;"O.K."
220 SAVE "BASIC": GO TO 220
290 STOP
500 IF ERR<>A THEN PRINT "ERROR
IN LINE ";NUM: STOP
510 PRINT NUM: READ A$,A: LET N
UM=NUM+10
520 RETURN
1000:
1010 DATA "2A535C2B01EB00CD5A160
111002A4F5C11D05C232373237209EB"

```

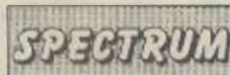
```

1020 DATA "21315B010600EDB021150
022105CFDCB30DEC9F409AB104BB0",4
295
1025:
1030 DATA "213B5CCB5E2016CBDE3EF
D32415CCDAB1028FBF5CD1D11AFCD011
6F1C9CDAB10F5FE0DCC125D",9014
1035:
1040 DATA "CDFB5CF1C93AB85CFE0DC
0110B5DCD1311C93A0D5C11D05CCD131
1C92A595C2B237EFE0DCBFC222073FE",
13870
1045:
1050 DATA "0E2B7AFE4038EFFE5B30E
B22B05C16A30194002AB05C030AFE36C
AA45DCB7F28031418F2BE20EF0B0A03",
18157
1055:
1060 DATA "1730E91E0103231C0ABE2
BF9CB7F20030B18D614E67FBE20D0237
EFE202812FE0D20C6233EB0BE2B20BF",
22151
1065:
1070 DATA "E5D5CD5216D1E11C06004
BA7ED427EFE202802230D72E523CDE81
9E11884237EFE2228F8FE80C818F523",
27261
1075:
1080 DATA "2323232318ECE5ED5B615
CA7ED52E1D018E021187911045B01330
OEDB0CD045B214B7911D05C01E000EDB
0C900",32014

```

Keyword

Glyn Kendall,
Streatham,
London SW16.



HAVING RECENTLY obtained a proper keyboard for the Spectrum that did not have the legends printed on the keys, and disliking the idea of painting them on, I set about writing a routine to enable the keywords to be typed in letter by letter. This may seem a retrograde step but using the multi-shifted Spectrum I find myself chanting things like Symbol Shift Caps Symbol Shift x to get Ink up on the screen.

The routine is not interrupt driven so will not tie up computing time, in fact it comes into operation between the time you press enter and the ROM's syntax checker gets at it. The working section consists of 223 bytes so you only lose about 230 bytes from Basic..

Enter the program and Run it, the checks will catch most of the errors and print what line they occurred in. When correct the Program will go into a loop and save itself in case of any undetected errors. When you are satisfied that you have saved enough copies break into the program and New it. Then enter.

RAND USR 31274

(continued on page 189)

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(continued from page 187)

This will put the code in the right place and turn it on. Press Enter and you should have a different cursor. If not or the program crashes then Load Basic again and carefully check it against the listing. If it is OK then Enter the header. This must be entered as listed — except for the colour statements — or the computer will crash.

SAVE "KEYWORD" LINE 1:SAVE "START" CODE 23300,51:SAVE "MAIN" CODE 23760,224

This will be the working copy so save it a

few times. You can now delete the header.

Start is put in the printer buffer because it is only needed once, so you can wipe it out if you want. Do not call Start more than once as it reserves memory for Main each time it is used. To turn it off

POKE 23736,168:POKE 23737,16

To turn it back on

POKE 23736,208:POKE 23737,92

It is safer if you put these commands on a single line separated by a colon. In fact I insist that you do. Note that the address of a line 1 Rem is no longer 23760.

Using keyword; the editor will search for keywords in capitals followed by a space or in certain circumstances non capitals i.e., numeric. If in doubt put a space. Single words like Run or List can be entered direct — no space. E mode and Graphics mode are recognised as is Symbol Shift Caps etc. The only thing missing is the K mode. Anything in quotes is ignored but a Rem line is not. This should not matter as the computer will jump it anyway. Do not forget that words like Goto and Gsub need spaces in them to be recognised.

Point plot

I S Gibson,
Maidstone, Kent.

BBC

THIS PROGRAM enables points to be plotted and lines to be drawn in Mode 6 and Mode 3. This means that including the program, there is 3K more than Mode 0 in Mode 3 and 1K more in Mode 6 than Mode 4. Points may be plotted using the form:

PROCLOT (X,Y)

and unplotted using

PROCUNPLOT (X,Y)

Also I've added a line drawing routine

PROCLINE (X1,Y1,X2,Y2;P)

where P is 1 for a plotted line and 0 for unplotted. The variable ST% must be 640 in Mode 3 or 320 in Mode 6.

If the screen is wobbly, change the 38 in line 70. Values between 30 and 45 are best.

```
10REM MODE 6 & MODE 3 PLOTTER
20REM by I.Gibson
30MODE 3
40STZ=640: REM STZ=320 for MODE 6
50VDU 23:8202:0:0:0:
60VDU 23:0:9:7:0:0:0:
70VDU 23:0:4:38:0:0:0:
80VDU 23:0:7:30:0:0:0:
90VDU 23:140:128:128:128:128:128:128:1
28
100PRINTTAB(0,11);"
"
110FOR DX=0 TO 24
120PRINTTAB(40,DX);CHR$(140);
130NEXT DX
140PROCLINE(320,104,320,104,1)
150FOR X5Z=0 TO 639
160PROCLOT(X5Z,90*SGN(X5Z/102)+104)
170NEXT
180END
10000DEF PROCLINE(XX1Z,YY1Z,XX2Z,YY2Z,SE%)
100100XZ=XX2Z-XX1Z:WNZ=YY2Z-YY1Z:ZZZ=SGN(00X)
:VVZ=SGN(WNZ):RRZ=SGN(00X):SSZ=0:NNZ=ABS(00X)
:MMZ=ABS(WNZ)
10020IF NNZ>MMZ THEN 10040
10030RRZ=0:SSZ=SGN(WNZ):NNZ=ABS(WNZ):MMZ=ABS(
00X)
10040JJZ=INT(NNZ/2)
10050FOR KKZ=0 TO NNZ
10060IF SETZ=1 THEN PROCLOT(XX1Z,YY1Z) ELSE
PROCUNPLOT(XX1Z,YY1Z)
10070JJZ=JJZ+MMZ
10080IF JJZ<NNZ THEN 10110
10090JJZ=JJZ+NNZ:XX1Z=XX1Z+ZZZ:YY1Z=YY1Z+VVZ
```

```
10100GOTO 10120
10110XX1Z=XX1Z+RRZ:YY1Z=YY1Z+SSZ
10120NEXT KKZ
10130ENDPROC
10140DEF PROCUNPLOT(XZ,YZ)
10150YZ=199-YZ
10160PZ=((XZ DIV B)*8+(YZ MOD B)) + (YZ DIV B)
)*8TZ
10170A$="00000000"
10180MZ=XZ MOD B
10190A$=LEFT$(A$,MZ)+"1"+MID$(A$,MZ+2)
102007(HIMEM+PZ)=7(HIMEM+PZ) OR FNBIT(VAL(A$))
)
10210ENDPROC
10220DEF PROCUNPLOT(XZ,YZ)
10230YZ=199-YZ
10240PZ=((XZ DIV B)*8+(YZ MOD B)) + (YZ DIV B)
)*8TZ
10250A$="
10260TIZ=7(HIMEM+PZ)
10270ENZ=256
10280FOR TRZ=1 TO B
10290ENZ=ENZ/2
10300IF TIZ>ENZ THEN TIZ=TIZ-ENZ:A$=A$+"1" E
LSE A$=A$+"0"
10310NEXT TRZ
10320MZ=XZ MOD B
10330A$=LEFT$(A$,MZ)+"0"+MID$(A$,MZ+2)
103407(HIMEM+PZ)=FNBIT(VAL(A$))
10350ENDPROC
10360DEF FNBIT(BZ)
10370IF BZ MOD 10>1 THEN =0
10380IF BZ=BZ MOD 2 THEN =BZ ELSE = FNBIT(BZ
DIV 10)*2+BZ MOD 2
```

Break-disable

Robert Newman,
Peterborough,
Northamptonshire.

SPECTRUM

I HAVE WRITTEN two machine-code routines for the Spectrum which disables the Break key during the running of a Basic program — i.e., preventing the errors "Break into program" and "Break — Cont repeats" from halting the program.

Routine A also causes the computer to reset when the program finishes, or if any error apart from Break occurs. This would be useful if you want to prevent people from listing or copying your program. However, unless your program is on a Microdrive, it could always be Merged instead of Loaded to overcome this.

Routine B just disables Break, so that if the program stops for any other reason it can be listed, edited, Run etc.

Put the lines of Basic from listing 1 at the

beginning of your program, using the Data statements for either routine A or routine B. Both routines can be used with 16K or 48K. You only need to change the Clear statement in line 2, and the value of Start in line 3.

If you only want to disable break during certain parts of your program, then miss out lines 5 and 6, and use the two Pokes later when you want to switch break-disable on. Break can then be re-enabled with these two Pokes:

POKE errsp,3:POKE errsp+1,19

Listing 1.

```
1 REM Break-disable (C) R Newman 1984
2 CLEAR 65329 : REM or 32559 if 16K
3 LET start = 65330 : REM or 32560 if 16K
4 LET errsp = PEEK 23613 + 256 * PEEK 23614
5 POKE errsp, start - 256 * INT (start/256)
6 POKE errsp+1, INT (start/256)
7 READ n
8 FOR j = start TO start + n - 1
9 READ a : POKE j,a
10 NEXT j
```

Use these DATA statements for routine A :-

```
11 DATA 27,33,start-256*INT(start/256),INT(start/256),229,58,58,
92,254,20,40,5,254
12 DATA 12,194,0,0,253,54,0,255,253,203,1,174,195,125,27
```

Use these DATA statements for routine B :-

```
11 DATA 33,33,3,19,58,58,92,254,20,40,4,254,12,32,15,33
12 DATA start-256*INT(start/256),INT(start/256)
13 DATA 229,253,54,0,255,253,203,1,174,195,125,27,229,195,3,19
```

Demo program for routine A.

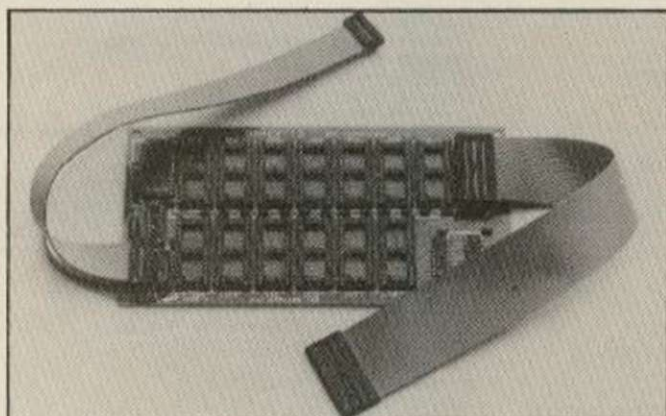
```
10 REM Break disable demo
20 REM Robert Newman 1984
30 REM Routine A
40 CLEAR 65329
50 LET start=65330
60 LET errsp=PEEK 23613+256*PEEK 23614
70 POKE errsp,start-256*INT (start/256)
80 POKE errsp+1,INT (start/256)
90 READ n
100 FOR j=start TO start+n-1
110 READ a:POKE j,a
120 NEXT j
130 DATA 27,33,start-256*INT (start/256),INT (start/256),229,58,58,92,254,20,40,
5,254
140 DATA 12,194,0,0,253,54,0,255,253,203,1,174,195,125,27
145 REM *****
146 CLS
```

```
150 PRINT "Demonstration of routine A."
160 PRINT "This routine disables BREAK."
170 PRINT "If any other error occurs, or the program finishes, the comp
uter will reset itself."
180 PRINT "This prevents the program from being listed or copied."
190 PRINT "Try pressing BREAK."
200 FOR j=1 TO 400
210 PRINT AT 10,10;j
220 NEXT j
230 CLS
240 PRINT "Pressing BREAK,N or space does not prevent scrolling."
250 FOR j=1 TO 50:PRINT j:NEXT j
260 PRINT "To return to start of demo,enter Y. Other inputs will cause reset"
270 INPUT a$
280 IF a$="Y" OR a$="y" THEN GO TO 145
```

Demo program for routine B.

```
10 REM Break disable demo
20 REM Robert Newman 1984
30 REM Routine B
40 CLEAR 65329
50 LET start=65330
60 LET errsp=PEEK 23613+256*PEEK 23614
70 POKE errsp,start-256*INT (start/256)
80 POKE errsp+1,INT (start/256)
90 READ n
100 FOR j=start TO start+n-1
110 READ a:POKE j,a
120 NEXT j
130 DATA 33,33,3,19,58,58,92,254,20,40,4,254,12,32,15,33
140 DATA start-256*INT (start/256),INT (start/256)
145 REM *****
146 CLS
150 PRINT "Demonstration of routine B."
160 PRINT "This routine disables BREAK."
170 PRINT "Successful completion, or any error except BREAK will stop the prog
ram, which can then be listed and RUN again."
180 PRINT "Try pressing BREAK."
190 PRINT "Try pressing BREAK."
200 FOR j=1 TO 500
210 PRINT AT 10,10;j
220 NEXT j
230 CLS
240 PRINT "Pressing BREAK,N or space does not prevent scrolling."
250 FOR j=1 TO 50:PRINT j:NEXT j
260 PRINT "To return to start of demo,enter Y. Other inputs will end program"
270 INPUT a$
280 IF a$="Y" OR a$="y" THEN GO TO 145
```


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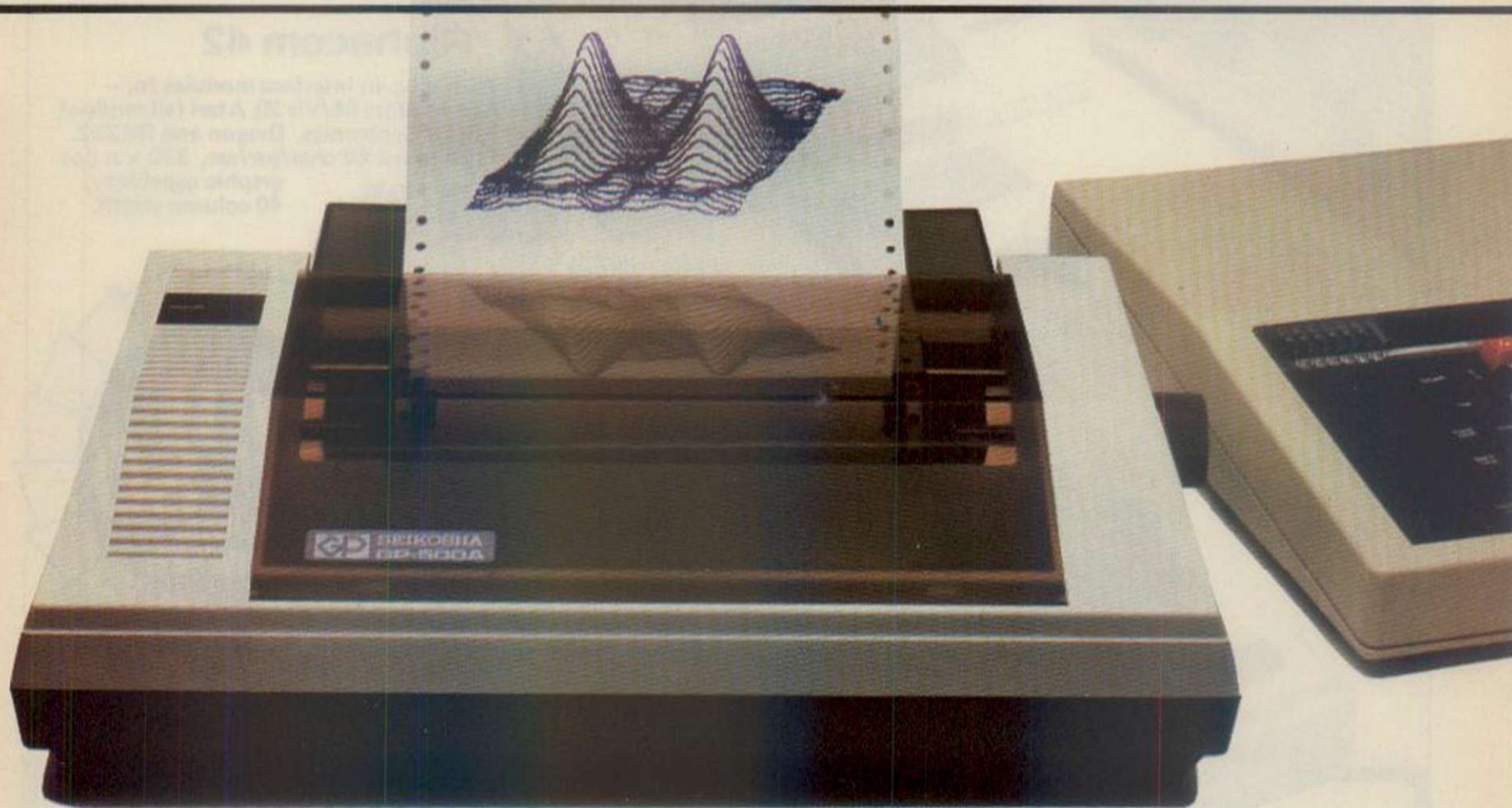
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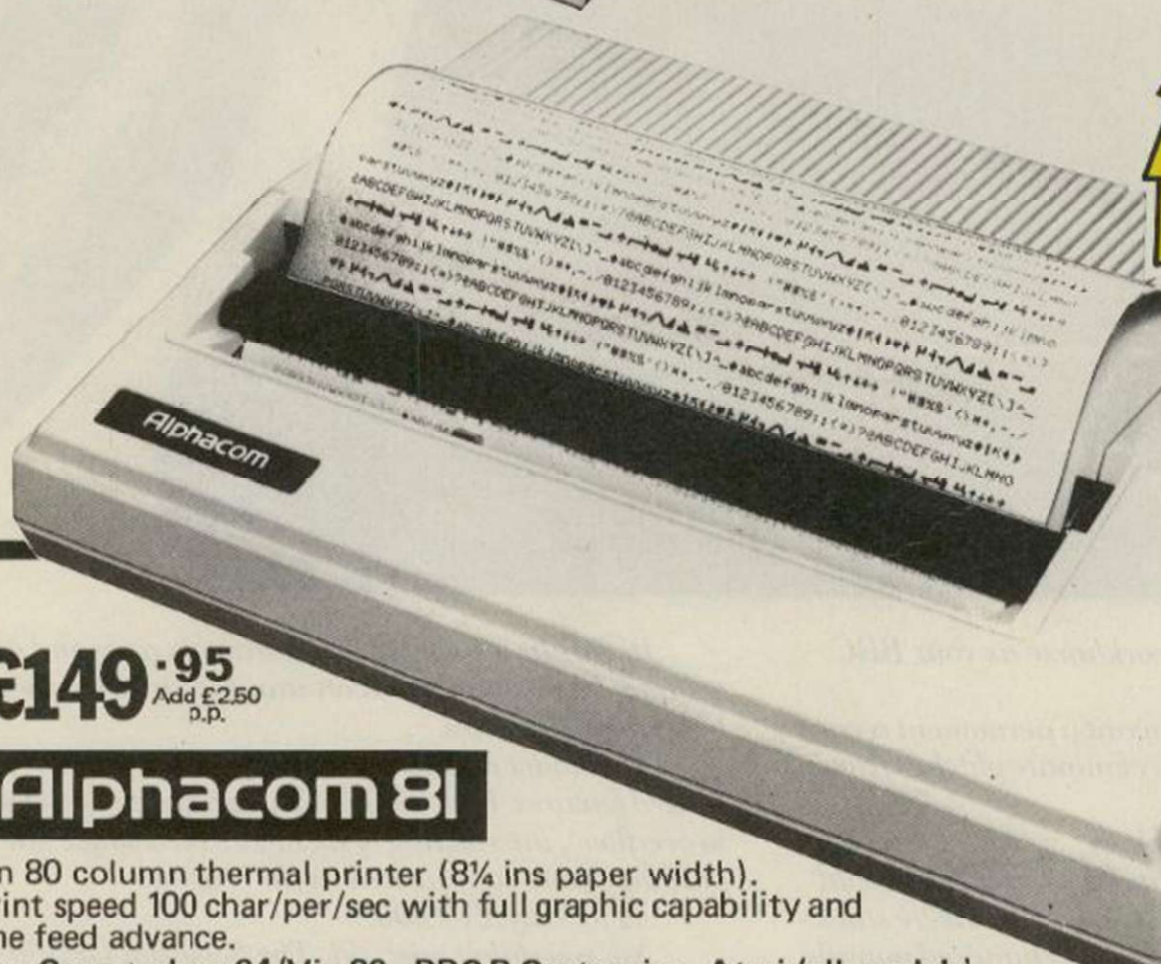
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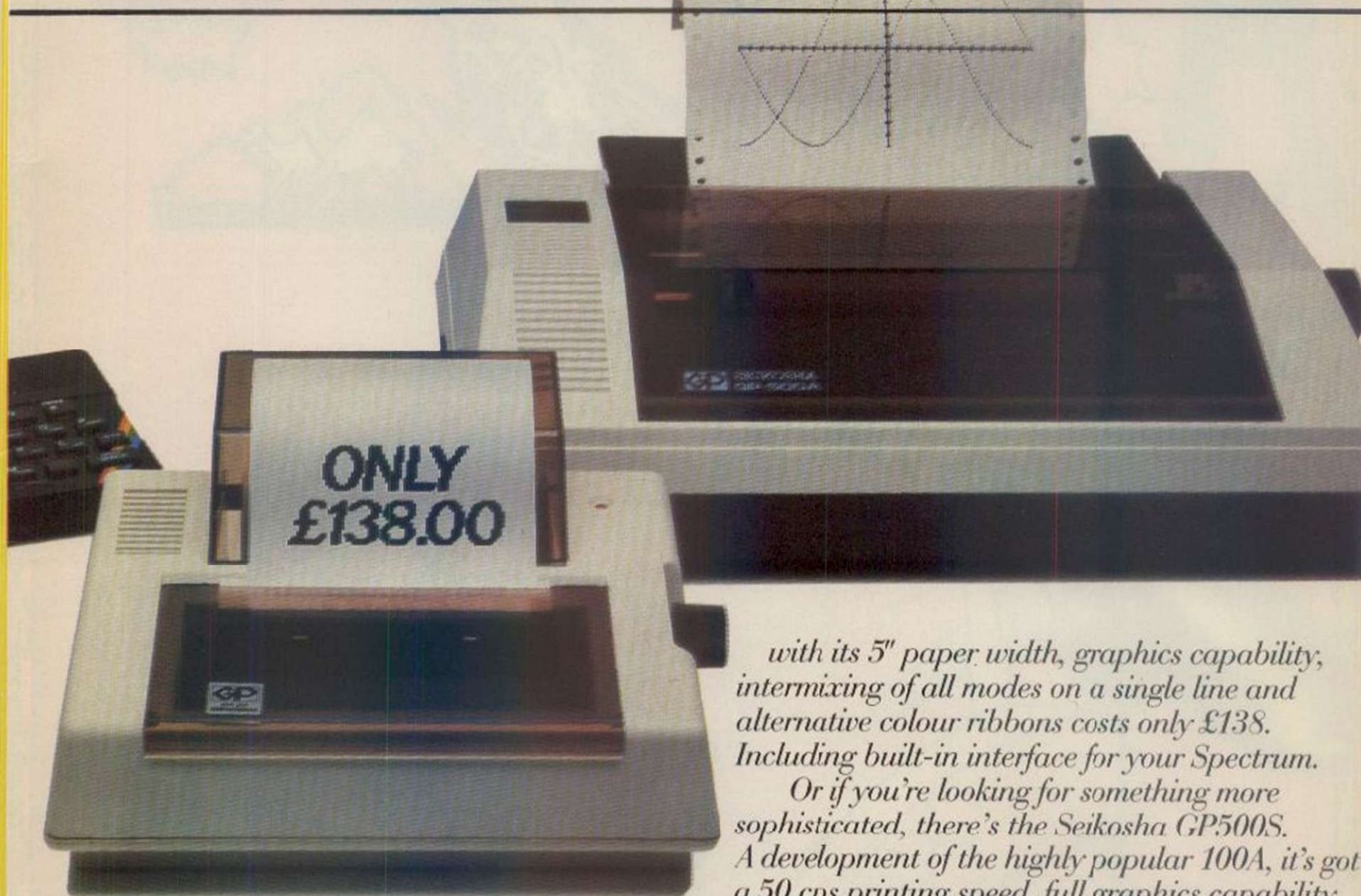
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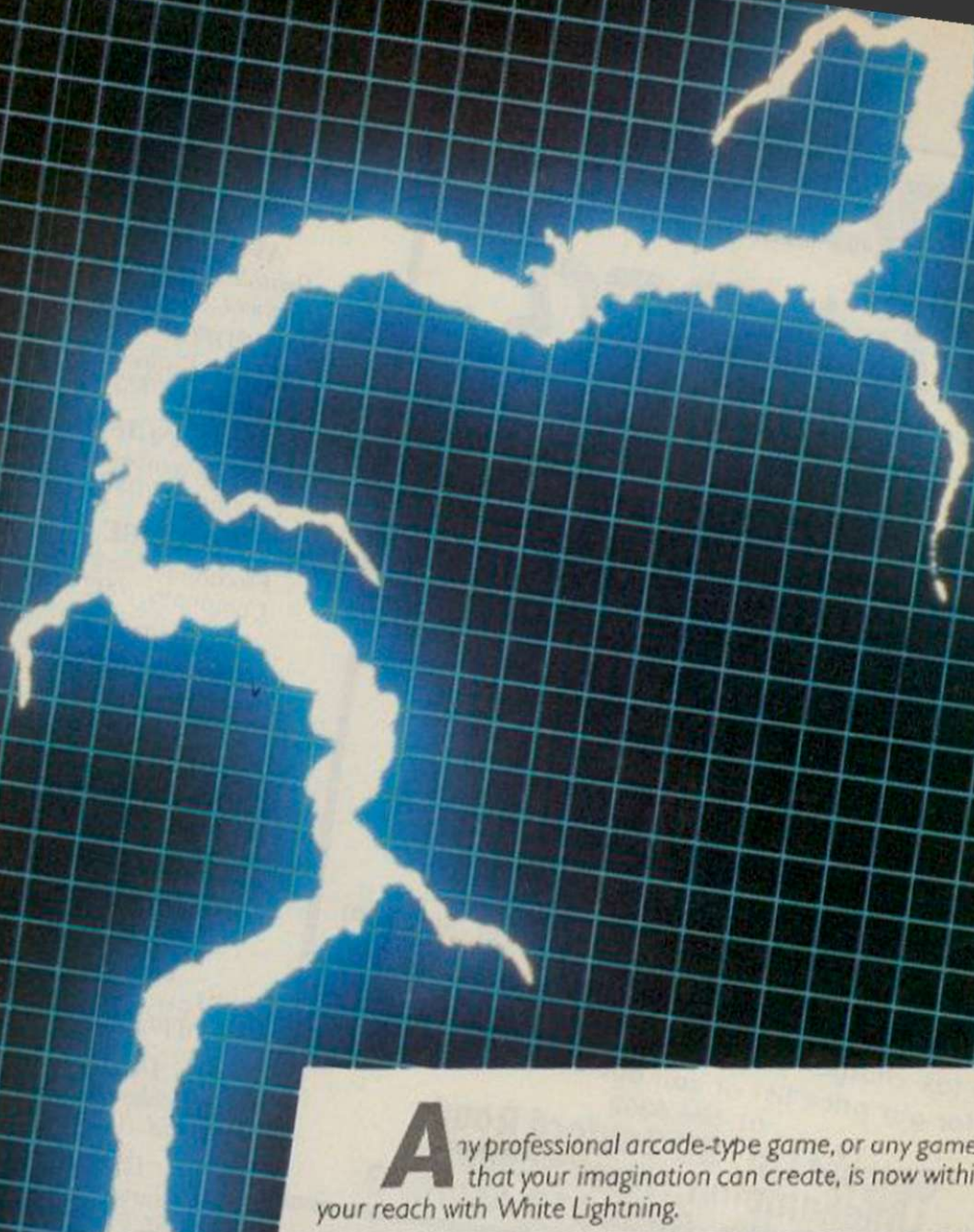
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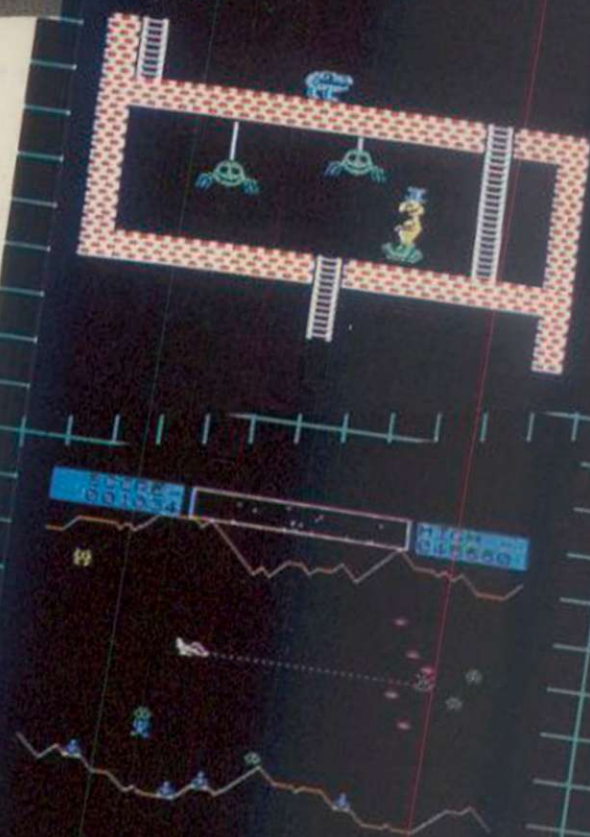
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IDEAL IDEAL is an Interrupt Driven Extendible Animation sub-Language. Once you have mastered IDEAL's easy to learn set of over 80 commands and just a little FORTH, you will be ready to produce arcade-quality games even if you don't know machine code. Up to 255 Sprites, each with its own user-defined dimensions can be moved around the screen (or memory), scrolled, spun, reflected enlarged or inverted with amazing speed and smoothness. Operations are possible between screen windows, Sprites and Sprite windows. Sprites can even stretch across several screens, so those difficult scrolling landscapes that form the basis of so many games are easy to achieve. Sinclair's own sound and graphics commands such as CIRCLE, DRAW and BEEP are fully supported, and there are some unique collision detection facilities.

MULTI-TASKING Because **White Lightning** uses interrupts, you can effectively run two programs at once. This means of course, that games like Space Invaders and Defender can be written without complex timing calculations. So while one



THE KEY TO PROFESSIONAL GAMES DESIGN


program smoothly scrolls the landscape, the second animates the other characters. This is undoubtedly one of **White Lightning's** most powerful features.

MARKETING AND PORTABILITY Although **White Lightning** uses an integer FORTH as its host language, programs can be written in a combination of BASIC, FORTH, IDEAL and machine language.

What is more, programs written in FORTH/IDEAL will be highly portable between the Spectrum and implementations under development for other popular micros.

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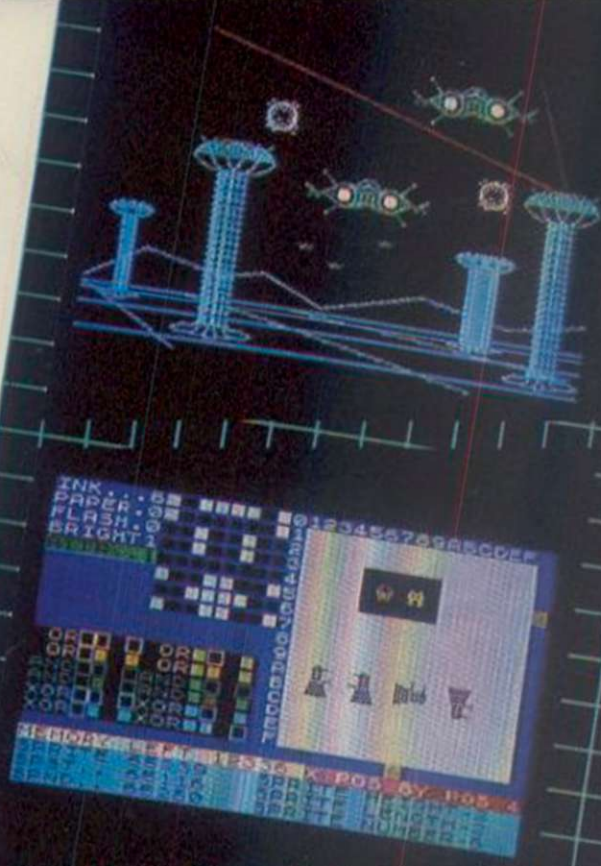
SPRITE DESIGN **White Lightning** comes complete with a separate 20K program for developing the Sprites used in the main system. Not only can you use this to design your own Sprites from scratch, it also comes complete with 168 pre-defined characters covering games like **Asteroids**, **Pac-Man**, **Assault Course**, **Defender**, **Space Invaders**, **City Bomber**, **Lunar Lander**, **Frogger**, **Centipede**, **Donkey Kong** and many, many, more. These characters are ready to use or can be enhanced. And Sprites can be saved to tape between editing sessions before being finally loaded into the main program.

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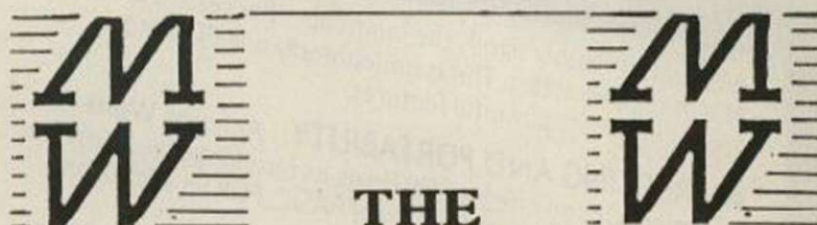
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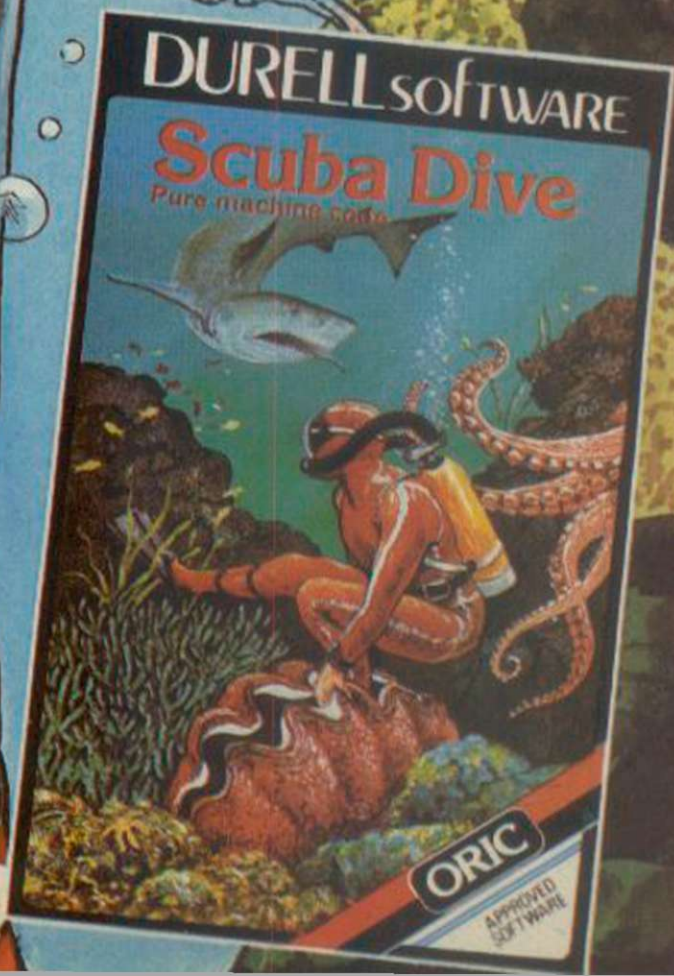
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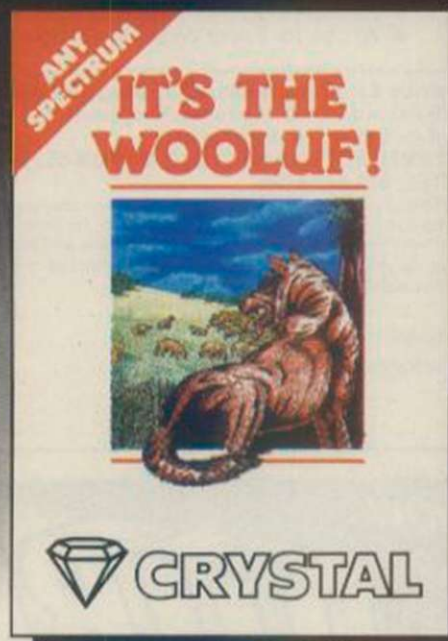
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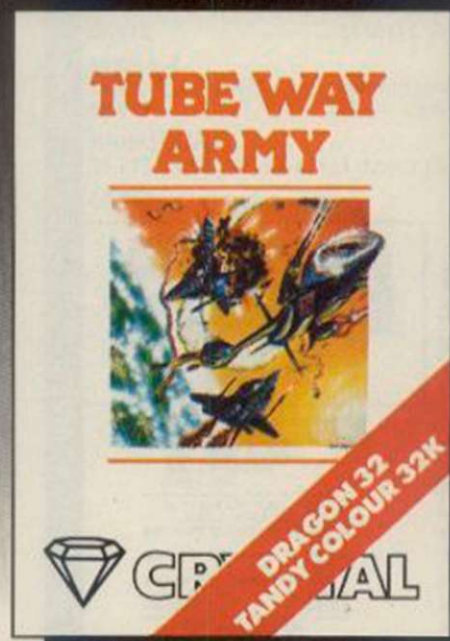
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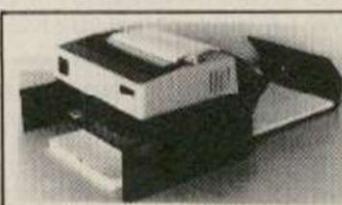
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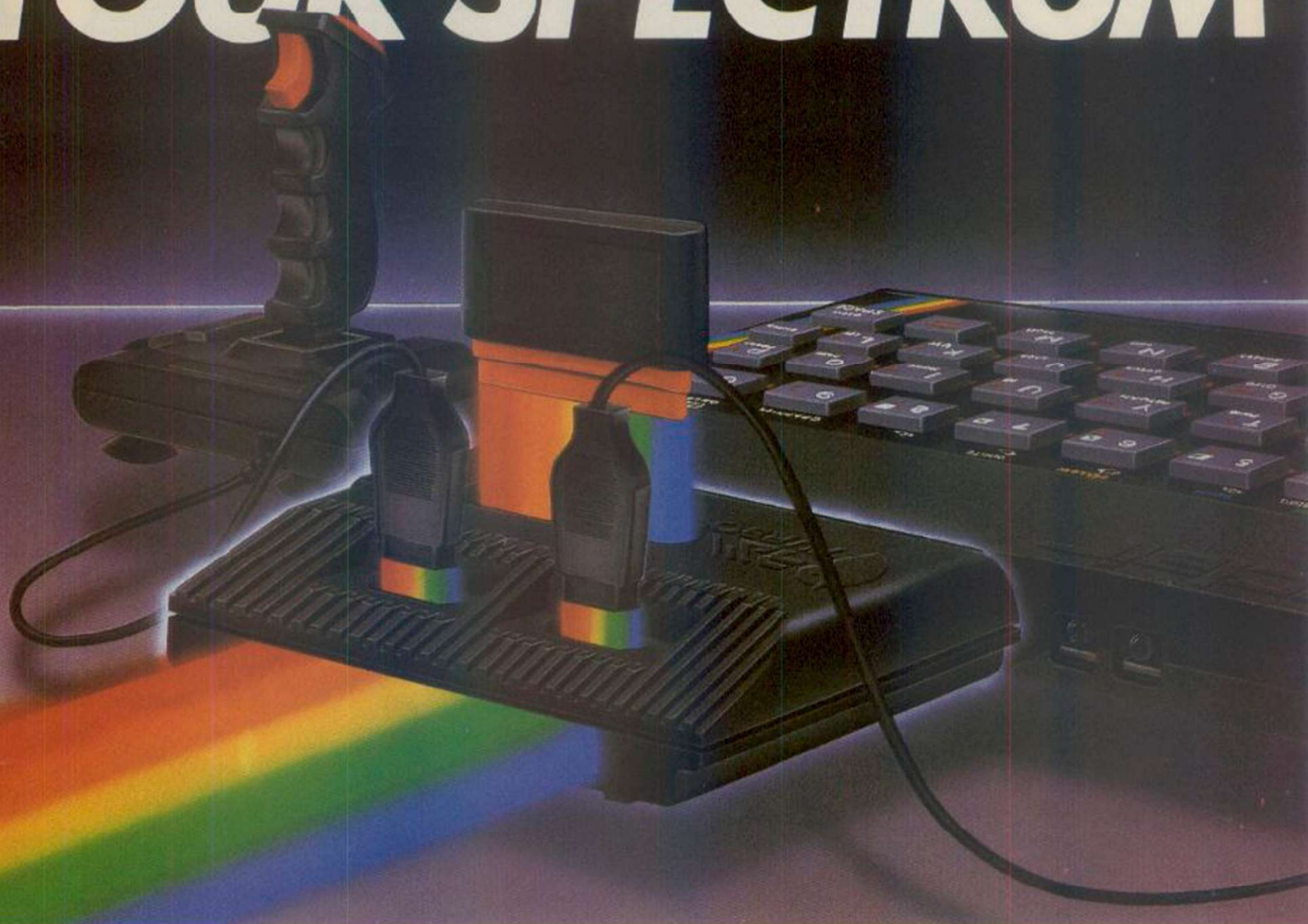
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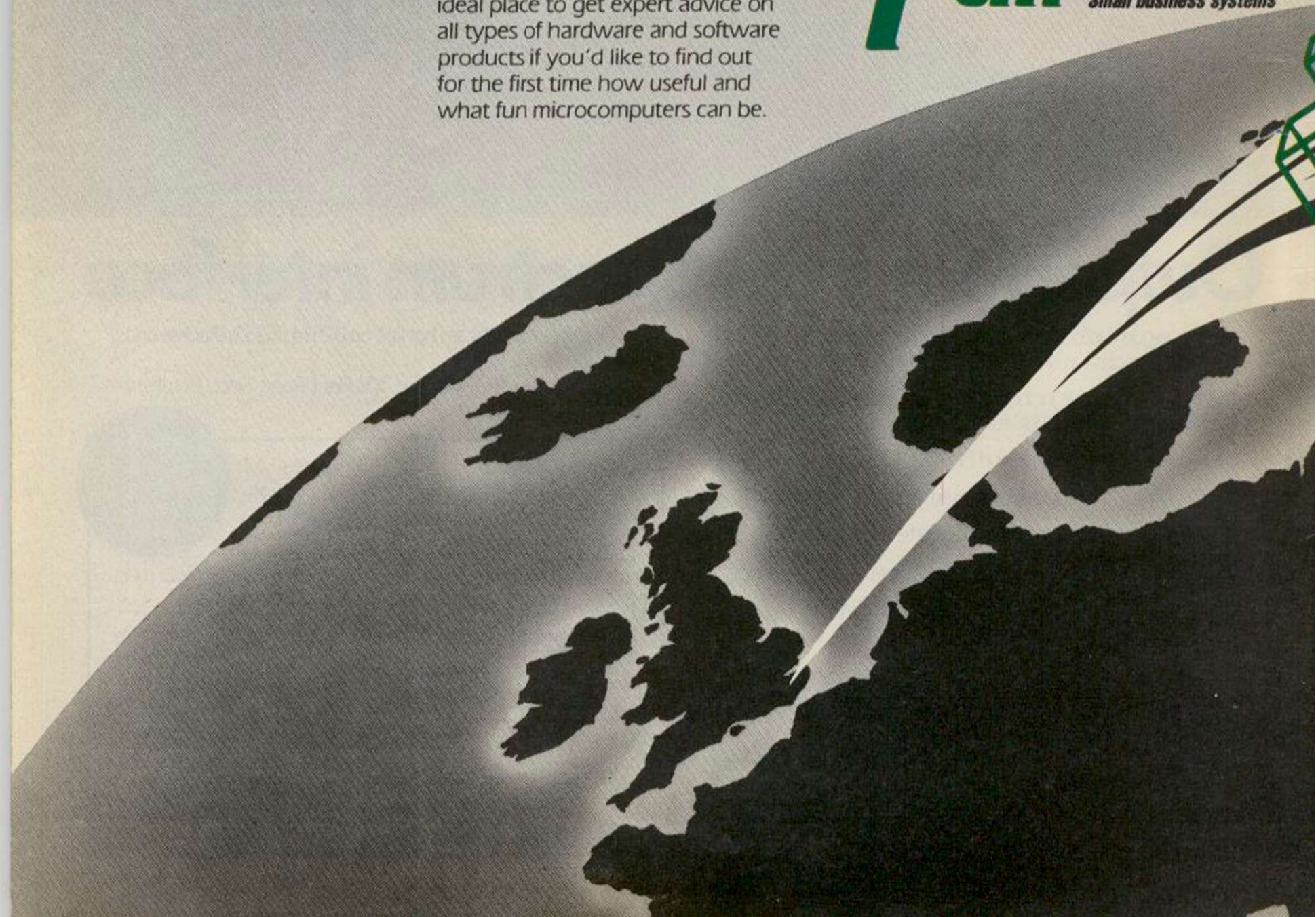
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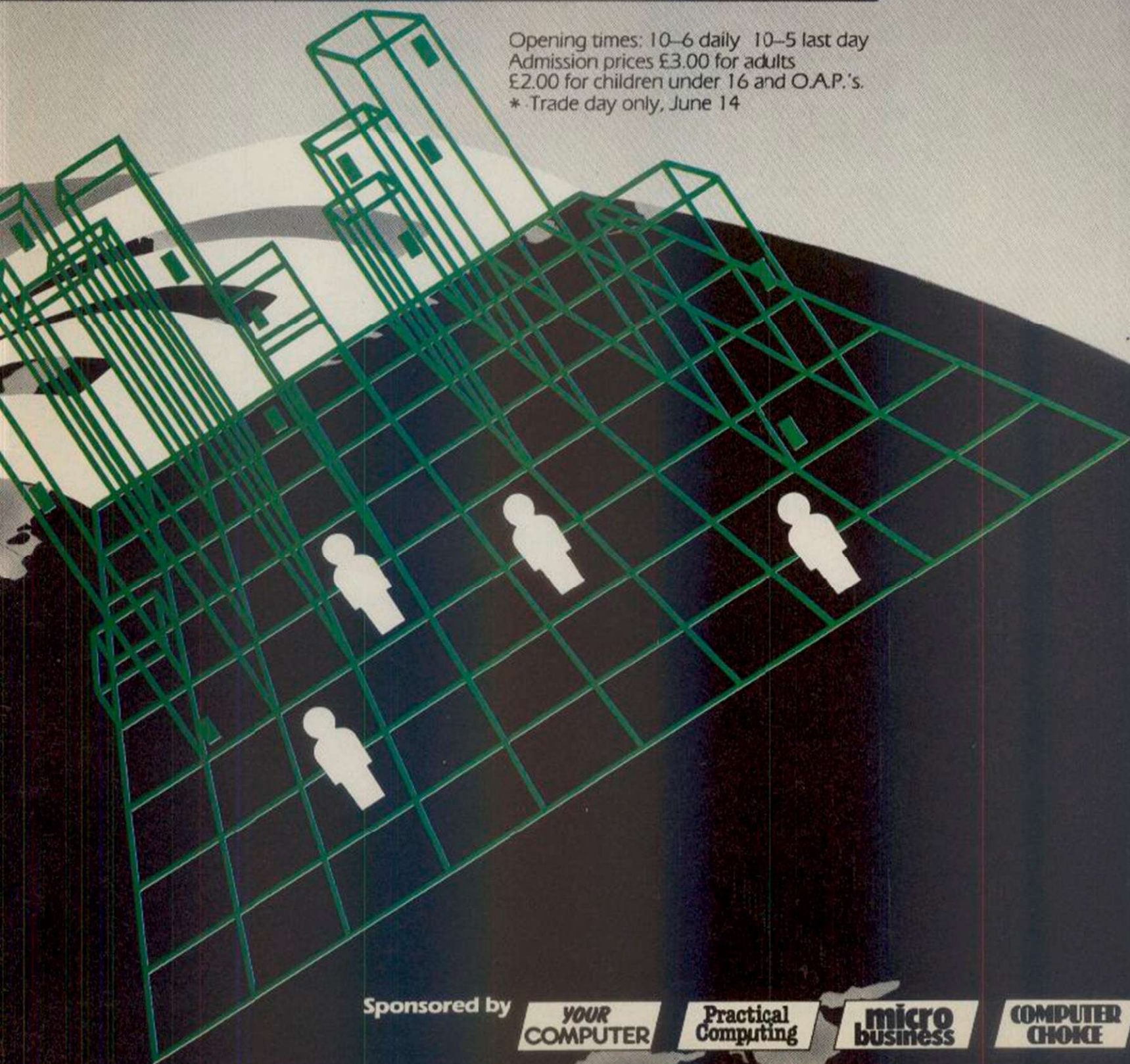
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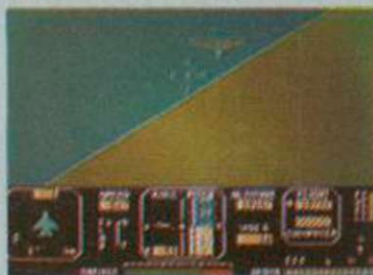
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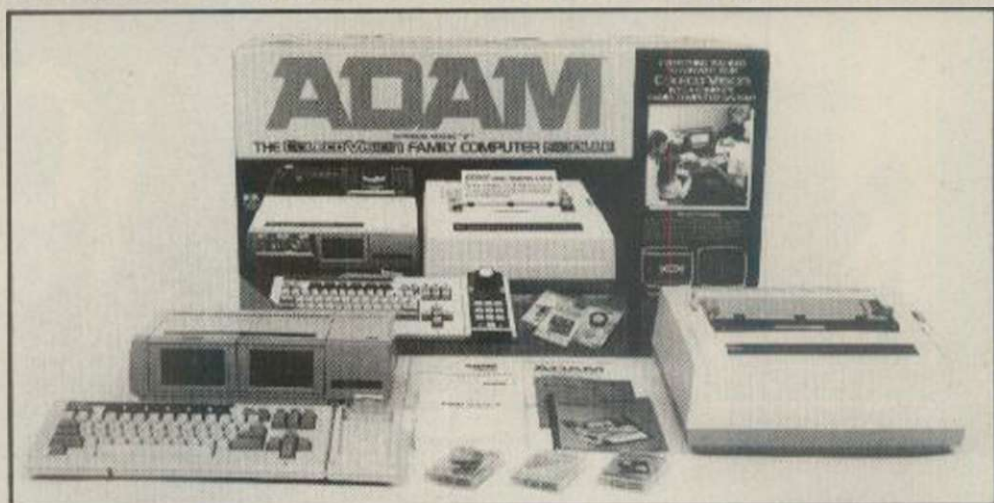
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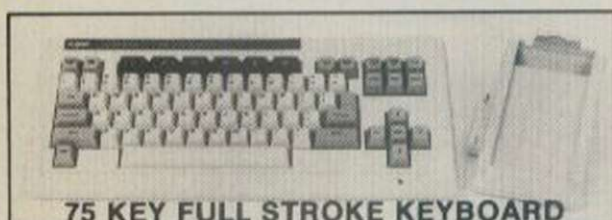
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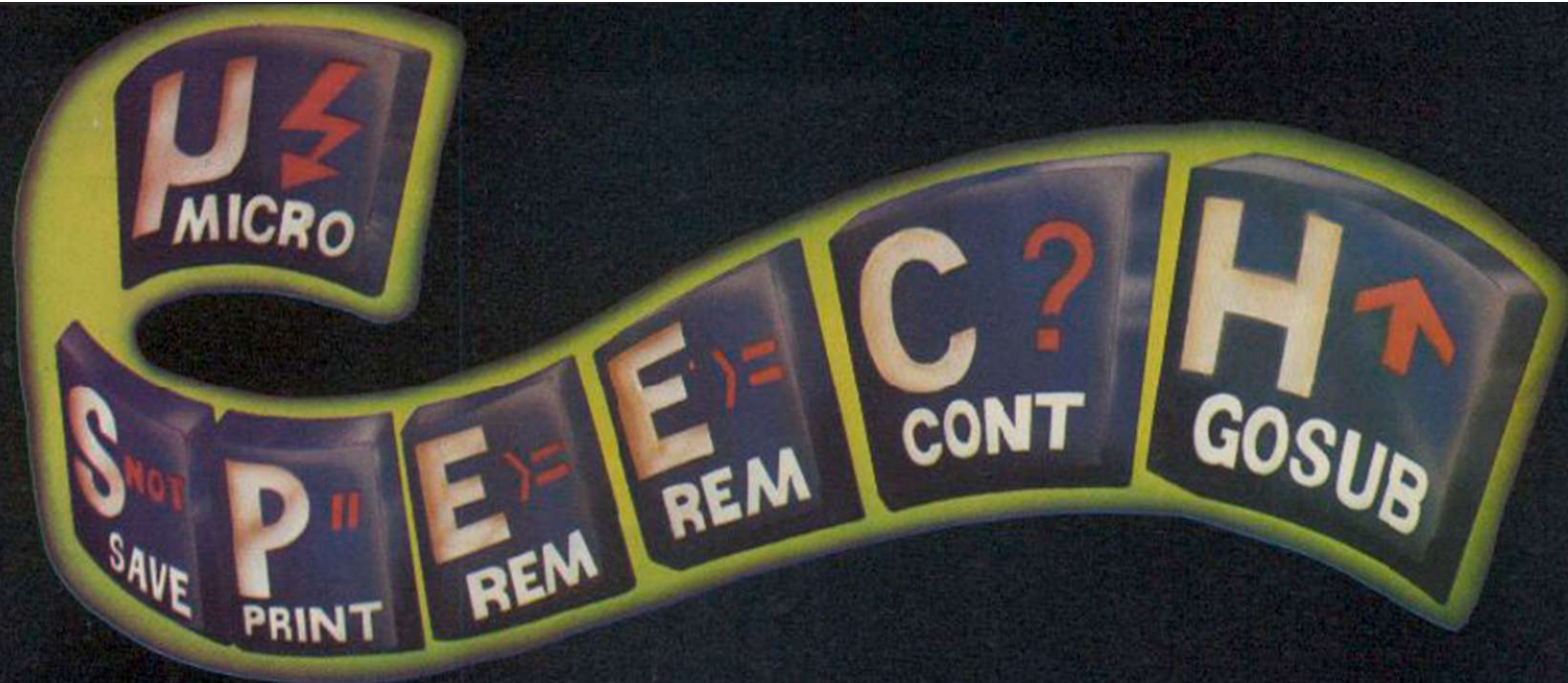
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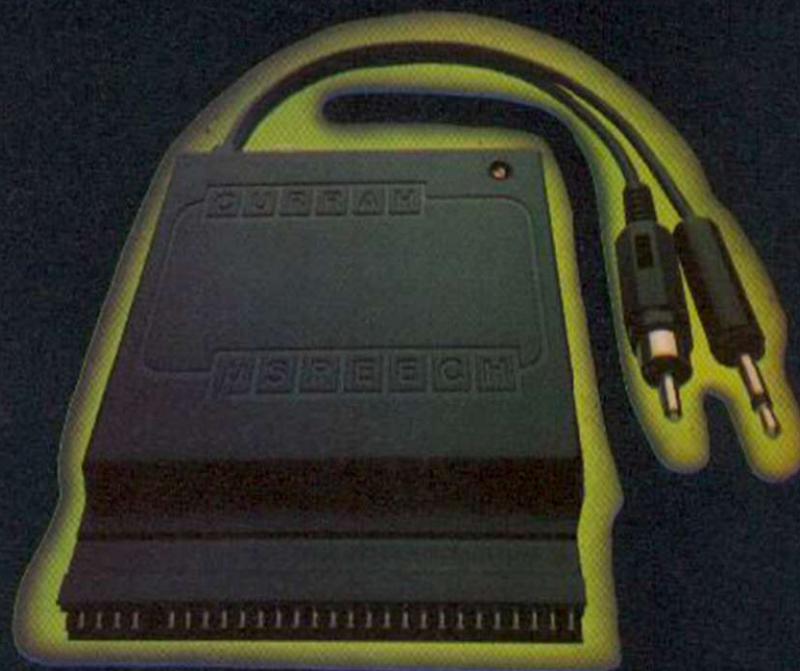
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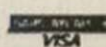
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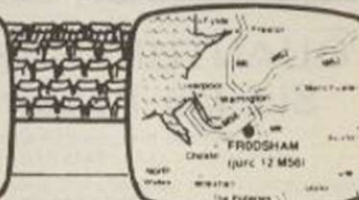
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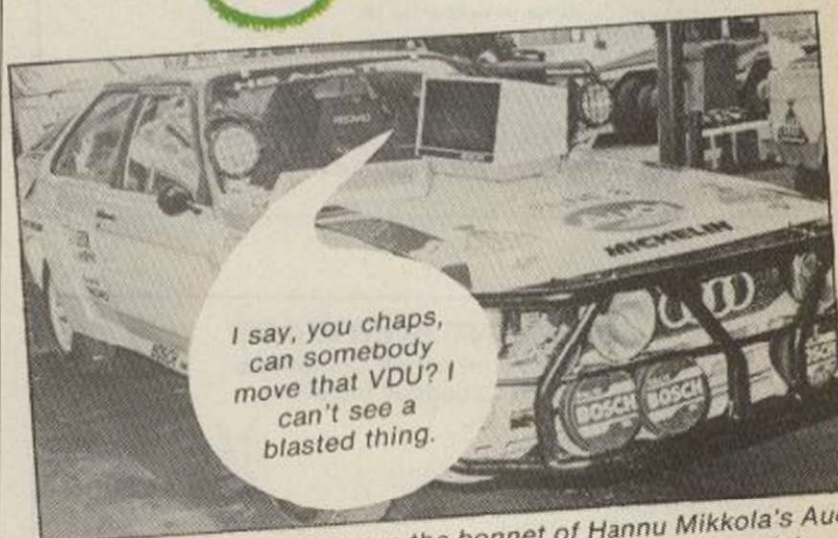
Local, national and international micro events are updated here. To publicise your event, phone Paul Bond on 01-661 3472.

Computer Fair

From June 14-17 at Earl's Court, sponsored by *Practical Computing* and *Your Computer* — this is the place to be seen if you have a micro-computer. Telephone Reed Exhibitions on 01-643 8040 for more information.

International Commodore Computer Show

From June 7-9 at The Novotel in Hammersmith. Commodore hardware and software. Contact Novotel in London for more details.



A Memory 7500 computer on the bonnet of Hannu Mikkola's Audi Quattro. Used in the Nairobi Safari Rally to process data — hopefully not on the bonnet of a car. This is very bad practice ergonomically, especially if you are sitting in the driver's seat.

Educational Software Fair

On 18 and 19 June there will be an Educational Computing and Software Fair at John Taylor Teachers'

Centre, Headingley Lane, Leeds. Teachers and all interested in education — in an ideal world, this would include pupils too, I guess — are welcome and it's free. Contact Mr G Creighton, Computer Development Team, at the above address. Telephone 0532-782181.

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- Selects the right wine for any meal.
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1. Beef Bourguignon
2. Chicken with Pesto
3. Chicken Paprikash
4. Chicken with Mushrooms
5. Chicken with Peas
6. Chicken with Potatoes
7. Chicken with Tomatoes
8. Chicken with Zucchini
9. Chicken with Onions
10. Chicken with Apples
11. Chicken with Carrots
12. Chicken with Celery
13. Chicken with Parsnips
14. Chicken with Turnips
15. Chicken with Cauliflower
16. Chicken with Broccoli
17. Chicken with Spinach
18. Chicken with Kale
19. Chicken with Swiss Chard
20. Chicken with Beetroot
21. Chicken with Radishes
22. Chicken with Turnip Greens
23. Chicken with Collard Greens
24. Chicken with Bok Choy
25. Chicken with Napa Cabbage
26. Chicken with Bean Sprouts
27. Chicken with Tofu
28. Chicken with Seitan
29. Chicken with Tempeh
30. Chicken with Miso
31. Chicken with Soy Sauce
32. Chicken with Sesame Oil
33. Chicken with Rice
34. Chicken with Noodles
35. Chicken with Dumplings
36. Chicken with Spring Rolls
37. Chicken with Pot Sticks
38. Chicken with Egg Rolls
39. Chicken with Fried Rice
40. Chicken with Fried Noodles
41. Chicken with Fried Dumplings
42. Chicken with Fried Spring Rolls
43. Chicken with Fried Pot Sticks
44. Chicken with Fried Egg Rolls
45. Chicken with Fried Rice
46. Chicken with Fried Noodles
47. Chicken with Fried Dumplings
48. Chicken with Fried Spring Rolls
49. Chicken with Fried Pot Sticks
50. Chicken with Fried Egg Rolls

INGREDIENTS FOR 4 (METRIC)

300g Chicken Pieces
200g Chopped Onions
50g Garlic
20g Dried Mushrooms
20g Dried Peppers
20g Dried Tomatoes
20g Dried Sweet Peppers
20g Dried Fennel
20g Dried Celery
20g Dried Parsnips
20g Dried Turnips
20g Dried Cauliflower
20g Dried Broccoli
20g Dried Spinach
20g Dried Kale
20g Dried Swiss Chard
20g Dried Beetroot
20g Dried Radishes
20g Dried Turnip Greens
20g Dried Collard Greens
20g Dried Bok Choy
20g Dried Napa Cabbage
20g Dried Bean Sprouts
20g Dried Tofu
20g Dried Seitan
20g Dried Tempeh
20g Dried Miso
20g Dried Soy Sauce
20g Dried Sesame Oil
20g Dried Rice
20g Dried Noodles
20g Dried Dumplings
20g Dried Spring Rolls
20g Dried Pot Sticks
20g Dried Egg Rolls
20g Dried Fried Rice
20g Dried Fried Noodles
20g Dried Fried Dumplings
20g Dried Fried Spring Rolls
20g Dried Fried Pot Sticks
20g Dried Fried Egg Rolls

RECIPE Page 1 of 2

1. Put the first 11 ingredients in a large pan, bring to the boil and simmer 10 minutes.
2. Meanwhile, clean and trim the mushrooms. Add to the pan.
3. Bring back to boil, simmer 10 minutes. Remove mushrooms with a slotted spoon.

Bring cooking liquor back to boil & reduce until syrupy.

Be sure to reduce the sauce well, for 6 people, 3 lbs. is about right.

The Computer Cook Book

For the 48K Spectrum. (on 2 cassettes).

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